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Fort Worth District

Three Oaks Mine

Final Environmental Impact Statement Volume I

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FINAL
ENVIRONMENTAL IMPACT STATEMENT
THREE OAKS MINE

Lead Agency:	Department of the Army U.S. Army Corps of Engineers Fort Worth District
Project Location:	Lee and Bastrop Counties, Texas
Comments on this EIS Should be Directed to:	Ms. Jennifer Walker, EIS Project Manager U.S. Army Corps of Engineers (USACE) Fort Worth District 819 Taylor Street P.O. Box 17300 Fort Worth, Texas 76102-0300 (817) 886-1733
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ABSTRACT

Alcoa Inc. proposes to construct and operate the Three Oaks Mine, a surface lignite mine that would be located east of Austin in Lee and Bastrop Counties, Texas. Alcoa has obtained a permit from the Railroad Commission of Texas (RRC) under Title 16, Part 1, Chapter 12 of the Texas Administrative Code. The RRC permit area for the proposed project consists of 16,062 acres; within the permit area, a total of 8,648 acres would be disturbed over the 25-year life of the mine for mining and ancillary facilities. An additional 6 acres would be disturbed for relocated roads outside of the permit area.

In addition to the mine pits, project facilities would include a central blending facility, a haul road and overland conveyor, surface water control features, power lines, a substation, road relocations, maintenance facilities, offices, and groundwater wells.

The proposed project also requires a permit from the U.S. Army Corps of Engineers (USACE) for the discharge of dredged and fill material into waters of the United States under Section 404 of the Clean Water Act. This permit decision is a major federal action with the potential to significantly affect the quality of the human environment; therefore, the USACE has determined that an Environmental Impact Statement (EIS) is necessary. This EIS describes the environmental impacts associated with the alternatives available to the USACE (issuance of a Section 404 permit, issuance of a permit with conditions, or denial of the permit application). The USACE has prepared this EIS with the assistance of a third-party contractor selected by the USACE. As part of the preparation of this EIS, the USACE has independently reviewed and evaluated the accuracy of the data contained and referenced in this EIS.

This Final EIS has been prepared in an abbreviated format; the Final EIS must be used in conjunction with the Draft EIS, which was issued August 23, 2002. The Draft EIS and Final EIS together comprise the complete EIS. The Final EIS is organized as follows: The Summary is reprinted in its entirety. Following the table of contents, text and appendix pages with revisions are reprinted in the Final EIS. Additions and changes to the Draft EIS are indicated in ***bold italics***; deletions are indicated as ~~crossed-out text~~. New Sections 4.4 and 4.5 describe the public comment period and provide responses to general public comments, respectively. Two new appendices, G and H, are included in the Final EIS. Appendix G comprises the U.S. Fish and Wildlife Service concurrence letter on potential impacts to sensitive species; the public comments received during the Draft EIS public review period and the USACE's associated responses are included in Appendix H of this Final EIS.

Responsible Official for EIS:

Robert P. Morris, Jr.
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

SUMMARY AND ACRONYMS AND ABBREVIATIONS

SUMMARY

Introduction

Alcoa Inc. (Alcoa) proposes to construct and operate the Three Oaks Mine, a surface lignite mine that would be located east of Austin in Lee and Bastrop Counties, Texas. Upon receiving all of the required permits and authorizations, construction is projected to begin in 2003, with operation commencing by 2004 and continuing for a period of approximately 25 years. The proposed project would include the mining of an average of 7.0 million tons of lignite per year in sequential mine pits. The lignite would be trucked to a central blending facility and subsequently transported via haul road or overland conveyor to four existing electrical power generating units located near Rockdale, in Milam County. The project also would include construction of surface water control facilities, power lines, maintenance facilities, offices, and the installation of groundwater wells. Up to approximately 12,000 acre-feet of groundwater would be pumped annually for mine dewatering and depressurization. Several existing county roads and utility lines would be relocated. Development of the Three Oaks Mine is proposed as a fuel-source replacement for the Sandow Mine, which Alcoa currently operates near Rockdale. The Sandow Mine has operated since the 1950s and will cease operations by 2005.

~~The project would require~~ ***Alcoa has obtained*** a permit from the Railroad Commission of Texas (RRC) under Title 16, Part 1, Chapter 12 of the Texas Administrative Code. The RRC permit area for the proposed Three Oaks Mine consists of 16,062 acres; within the permit area, a total of 8,648 acres would be disturbed over the 25-year life of the mine for mining and ancillary facilities. Of this total, approximately 640 acres would be disturbed for surface mining at any one time, based on sequential backfilling and concurrent reclamation of the mine pits. A total of 6 acres would be disturbed for relocated roads outside of the RRC permit area. City Public Service, the City of San Antonio public utility, owns 9,911 acres of land within the RRC permit area and controls an additional 1,721 acres through leases. Alcoa owns 2,855 acres and leases 548 acres within the permit area.

The proposed project ***also*** requires a permit from the U.S. Army Corps of Engineers (USACE) for the discharge of dredged and fill material into waters of the United States (U.S.) under Section 404 of the Clean Water Act. Because the permit decision is a major federal action with the potential to significantly affect the quality of the human environment, the USACE has determined that an environmental impact statement (EIS) is necessary. The USACE***, with the assistance of a third-party contractor,*** is the federal agency preparing the EIS in compliance with the National Environmental Policy Act of 1969. The USACE's permit area for this EIS comprises the RRC permit area for the Three Oaks Mine and the additional 6 acres of disturbance associated with proposed relocated roads outside of the RRC permit area. Alternatives available to the USACE include issuance of a Section 404 permit, issuance of a permit with conditions, or denial of the permit application. ***As part of the preparation of this EIS, the USACE has independently reviewed and evaluated the accuracy of the data contained and referenced in the EIS.***

This EIS describes the proposed construction, operation, and reclamation of the Three Oaks Mine (the Proposed Action), including Alcoa's proposed environmental protection measures; identifies alternatives to the Proposed Action available to Alcoa; identifies alternatives available to the USACE relative to the

Section 404 permit; and describes the environmental consequences of implementing the Proposed Action and the No Action Alternative.

The proposed Three Oaks Mine would involve a number of activities, which are discussed in much greater detail in Chapter 2.0, and would result in various environmental impacts, which are identified and discussed in Chapter 3.0. The basic construction, operation, and reclamation activities include the following:

- Clearing or vegetation removal from several hundred acres each year;
- Construction of support facilities, haul roads, public road reroutes, and utility reroutes upon project commencement;
- Excavation of a mine pit to access the lignite seams, accompanied by selective stockpiling of the overburden;
- Pumpage of groundwater from below and immediately above the lignite seams;
- Removal of the exposed lignite from the pit, and transport of the lignite to the existing Rockdale power generating station;
- Selective replacement of overburden and soil materials in the previously mined pits;
- Reshaping and recontouring of the previously mined area to the desired post-mine topography;
- Revegetation of the previously mined area; and
- Final closure and reclamation of ancillary facilities.

These activities, with the exception of the initial construction and final closure and reclamation, would continue repeatedly throughout the life of the mine until the lignite has been removed from the entire mine area. This is the same process that has been occurring at the nearby Sandow Mine for the past 50 years. The primary difference between the proposed Three Oaks Mine and the existing Sandow Mine, aside from the location, is that substantially less groundwater would be pumped for the proposed Three Oaks Mine.

Summary of Impacts

The following sections summarize the environmental impacts associated with the proposed Three Oaks Mine, as identified in this EIS. A table summarizing and comparing the impacts of the Proposed Action and the No Action Alternative is provided in **Table 2-16** in Chapter 2.0. Descriptions of the potential direct, indirect, and cumulative impacts of the Proposed Action and the No Action Alternative and monitoring and mitigation measures that may be appropriate are provided in Chapter 3.0 of this EIS.

Geology and Mineral Resources

Lignite mining at the Three Oaks Mine permanently would alter the topography in the disturbance area, particularly at the end lakes where topographic depressions may be created. Other areas would be recontoured to slopes that are similar to pre-mining conditions. No geologic hazards are expected to affect the mine during operation, and none would remain in the permit area following reclamation. Mining permanently would remove the economic lignite resources within the mined area and may affect existing clay resources. Existing geologic strata of sands, clays, and silts would be replaced by a mixed substrate to the depth of the lowest lignite seam to be mined, ranging from 30 feet to 250 feet.

Based on the current lignite production trends in Texas and foreseeable mining activity in the near future, the cumulative impacts of lignite mining at the Three Oaks Mine, relative to geology and mineral resources, appear to be minimal.

Water Resources

Groundwater

The proposed Three Oaks Mine would pump groundwater from the Simsboro aquifer for mine depressurization and groundwater from the Calvert Bluff aquifer for mine dewatering in order to facilitate mining. Depressurization pumpage would reach approximately 11,000 acre-feet per year by the end of the estimated 25-year life of the Three Oaks Mine. Pumpage for dewatering is expected to range from approximately 300 to 1,300 acre-feet per year over the life of the mine.

Groundwater levels in the Simsboro aquifer would decline approximately 10 to 50 feet in the outcrop area west of the proposed Three Oaks Mine; the potentiometric surface in the artesian portion of the Simsboro aquifer beneath the mine permit area would decline approximately 100 to 200 feet. The artesian portion of the Simsboro aquifer lies at depths of several hundred feet below the mine permit area. With a decline of 200 feet in the potentiometric surface, the aquifer would remain saturated.

The Calvert Bluff aquifer also lies at substantial depths below the mine permit area and largely is under artesian pressure. In the lowest lignite zone of the Calvert Bluff, the potentiometric surface would decline approximately 10 to 100 feet outside of the permit area and 100 to 200 feet within the permit area of the proposed Three Oaks Mine. For the Calvert Bluff upper lignite zone, the potentiometric surface would decline approximately 10 to 20 feet outside of the permit area and up to 50 feet within the permit area.

Private and municipal wells that are located within the area where groundwater drawdown is estimated to be 10 feet or less would be unlikely to be affected. Wells located within the drawdown areas of 20 feet or greater for either the Simsboro aquifer or the lower-third of the Calvert Bluff aquifer may need to be modified or replaced. Alcoa would mitigate any mine-related impacts to these wells, as required by the RRC.

Cumulative impacts due to groundwater withdrawal primarily would be the result of regional municipal pumpage of groundwater in the lower basin area of the Brazos G Regional Water Planning Area. Pumpage of groundwater from the Sandow Mine and proposed Three Oaks Mine areas by the San Antonio Water

System (SAWS) also would contribute substantially to cumulative groundwater impacts. The proposed Three Oaks Mine would have a limited contribution to cumulative groundwater impacts, as mine-related drawdown mainly would be in the immediate Three Oaks Mine area and would ~~cease~~ ***begin to rebound*** in approximately year 2030, shortly after the proposed Three Oaks Mine ceases operation. In addition, if municipal and SAWS pumpage reduces the artesian head pressure in the mine area, then Alcoa's depressurization goals would be met through a reduction in mine-related pumpage from the Simsboro aquifer. Three cumulative impact scenarios were evaluated in this EIS.

- Under the Three Oaks without SAWS cumulative scenario, drawdown in the Calvert Bluff aquifer would be approximately 10 to 20 feet in the mine area and 10 feet outside of the mine area by year 2030. By year 2050, the drawdown in the mine area and in adjacent areas of Lee, Bastrop, and Milam Counties would be approximately 10 feet. Drawdown in the Simsboro aquifer would be 70 to 80 feet in the mine area, 20 to 50 feet in the outcrop area of the Simsboro west of the mine, and 20 to 50 feet near the Colorado River in Bastrop County by year 2030. By year 2050, drawdown in the mine area would be approximately 60 feet and drawdown in the outcrop area and near the Colorado River would be 20 to 50 feet.

- Under the Three Oaks with SAWS cumulative scenario, drawdown in the Calvert Bluff would be approximately 20 feet in the mine area and approximately 10 to 20 feet in adjacent areas of Lee, Bastrop, and Milam Counties by year 2030. By year 2050, drawdown throughout most of the Calvert Bluff in the Three Oaks and Sandow Mine areas would be approximately 10 feet. For the Simsboro aquifer, drawdown at the mine area would be approximately 60 to 100 feet by year 2030 with drawdown in the outcrop area west of the mine being approximately 30 to 50 feet, drawdown in the outcrop area west of the Sandow Mine being approximately 40 to 100 feet, and drawdown at the Colorado River in Bastrop County being approximately 10 to 50 feet. By year 2050, drawdown in the Three Oaks Mine area would be approximately 100 to 180 feet, drawdown in the outcrop area west of the mine would be approximately 70 to 100 feet, and drawdown at the Colorado River would be 10 to 80 feet.

- Under the SAWS without Three Oaks cumulative scenario, drawdown in the Calvert Bluff would be approximately 10 feet throughout Lee, Bastrop, and Milam Counties by year 2030. This would remain approximately the same through year 2050. For the Simsboro aquifer, drawdown in the mine area would be approximately 70 to 130 feet by year 2030 with drawdown in the outcrop area of the Simsboro west of the mine being approximately 40 to 70 feet, and drawdown at the Colorado River in Bastrop County being approximately 10 to 50 feet. By year 2050, drawdown at the mine area would be approximately 100 to 210 feet, drawdown in the outcrop of the Simsoboro west of the mine would be approximately 70 to 100 feet, and drawdown at the Colorado River would be approximately 10 to 80 feet.

Surface Water

Approximately 38 miles of intermittent and ephemeral stream channels would be removed during the life of the proposed Three Oaks Mine. In addition, approximately 150 stock ponds would be removed in phases as mining progresses, and other small stream channels would be restricted from continuing downstream by the post-mining topography. The phased removal of surface water features would be offset at least in part by

creating and enhancing additional wetlands and riparian woodland at the Middle Yegua Creek Mitigation Site, by restoring waters of the U.S. and other water features at the replacement ratios proposed in Alcoa's ~~draft~~ Mitigation Plan, by implementing the riparian corridor restoration aspects of the fish and wildlife plan, and by the placement of small ponds and establishment of end lakes as proposed in the reclamation plan.

Construction and operation of the proposed surface water management system would reduce sediment yields, attenuate peak flows, lengthen the duration of flows by routing them through the system, and manage runoff water quality in accordance with Texas Natural Resource Conservation Commission and RRC regulations. Monitoring and compliance with Texas Pollutant Discharge Elimination System (TPDES) and Clean Water Act Section 401 water quality certification requirements would mitigate potential impacts to surface water quality. During mining, increased surface water flows would occur in Big Sandy Creek and Middle Yegua Creek as a result of flow augmentation from groundwater pumping discharges. During pumping and discharge, the volume and duration of these augmented flows generally would offset the potential flow reduction associated with groundwater drawdown in these drainages. When the discharges cease, water level changes associated with groundwater drawdown would decrease seasonal flows on gaining stream reaches (within the 20-foot drawdown area of the Simsboro outcrop) and channels immediately downstream of the discharge areas. These effects would be most noticeable during low-flow periods. These potential effects generally would mimic pre-mining conditions, where streams lose flows through seepage to aquifer recharge, or typically go dry under natural conditions.

Erosion and sedimentation would be limited during mining by phased, concurrent reclamation and by the proposed surface water management system. After mining, recontouring and revegetation in accordance with RRC requirements would mitigate potential erosion and sedimentation impacts. The post-mining topography would route approximately 15.3 square miles of watershed area through end lakes, which may not contribute to streamflows during average and low-flow runoff events. During periods when the lakes are nearly full and evaporation rates are low, larger runoff events would contribute to downstream flows after being routed through the proposed sediment ponds and end lakes, ultimately discharging to streams. Following mining and reclamation, reduced baseflows would occur from groundwater drawdown. On streams near the mine area, this would cause net reductions in seasonal flows, which gradually would be alleviated as aquifer ~~recharge~~ ***rebound*** occurs over time. Post-mining effects would decrease farther downstream as additional tributaries contribute flows, and as naturally occurring seepage and evapotranspiration occur. No impacts to the Colorado River or Somerville Lake are anticipated from the Proposed Action. Also, no impacts to surface water rights are anticipated from the Proposed Action. Additional monitoring and mitigation measures may be appropriate as determined by the USACE with respect to low-flow effects, end lake shoreline configurations, control of erosion and sedimentation at the end lake outlets and stream crossings along the proposed haul road, and management of pumping discharges through TPDES outfalls.

Cumulative impacts to surface water resources would result from the existing operation and final reclamation of the Sandow Mine; construction, operation, and reclamation of the proposed Three Oaks Mine; and surface water effects associated with water level changes in the drawdown area of the Simsboro outcrop as a result of regional pumping in the Simsboro aquifer. These impacts would include the creation of end lakes and a greater number of large ponds in place of distributed smaller ponds, a minor reduction of average annual surface water yields, control of flows in ephemeral drainages immediately downstream of

the end lakes, and reduced groundwater contributions to stream flows in gaining reaches (segments of streams that receive a portion of their flow from groundwater sources) of area streams within the 20-foot drawdown area of the Simsboro outcrop. The extent and magnitude of the latter impact largely would depend on the demand for groundwater supplies in the region. These impacts would occur to varying degrees depending on the cumulative impact scenario. Additional evaporation of surface water from the end lake surfaces would occur; however, this is not likely to create an incremental impact beyond the existing causes of surface water losses in the region. Overall, it is anticipated that the Three Oaks Mine only would contribute minimally to cumulative impacts on surface water quantity. It is anticipated that the Three Oaks Mine would not contribute cumulatively to impacts on water quality or surface water rights in the Colorado River.

Waters of the U.S. Including Wetlands

A total of 67.4 acres of jurisdictional waters of the U.S. would be impacted as a result of mine construction and operation. This would include 5.3 acres of wetlands, 19.9 acres of ephemeral stream channels, 3.7 acres of intermittent stream channels, and 38.5 acres of on-channel ponds. In addition, approximately 5.2 acres of wetlands, approximately 11.5 acres of streams with associated riparian habitat, and approximately 56.8 acres of on-channel ponds that are located outside of the disturbance area may be affected as a result of water level changes in the drawdown area of the Simsboro outcrop. Concurrent reclamation would result in the onsite replacement of ~~a total of 86.7 acres of waters of the U.S., including 5.3 acres of wetlands, 23.6 acres of stream channel, and 57.8 acres of on-channel ponds. An~~ ***similar acreages of the disturbed features.*** ~~a~~***A***dditional ~~5.~~ ~~3 acres~~ ***areas*** of wetlands ***and other waters of the U.S.*** would be created~~, and 20.6 acres of riparian vegetation would be~~ ***or*** enhanced~~,~~ at the offsite Middle Yegua Mitigation Site ***and the Big Sandy Mitigation Site***.

The short-term loss of waters of the U.S. (wetlands), which would be disturbed and replaced incrementally over 25 to 30 years, would result in the temporary loss of their functional value (e.g., runoff and sediment retention), ~~potentially affecting downstream water quality~~***which potentially could create temporary effects on downstream water quality***. Additionally, the removal of jurisdictional watercourses would alter the flow pathways for runoff water. However, implementation of the proposed storm water management system, including the construction of sediment ponds and diversion channels, likely would provide comparable or greater storm water management and sediment removal capacities than the affected water features. Implementation of Alcoa's proposed Mitigation Plan would result in the creation and enhancement of wetlands and riparian woodlands at the offsite Middle Yegua Creek Mitigation Site ***and the Big Sandy Mitigation Site*** during the initial years of the project, thereby providing early, partial mitigation for the anticipated impacts related to the mine.

Minor temporary increases in sediment loading to ephemeral and intermittent streams likely would result during initial construction activities while sediment and surface water management systems are being installed. Subsequently, sediment yields to area streams likely would be less than under pre-mining conditions, potentially resulting in a change in substrate in receiving streams. ~~However, this change is expected to be minor and would be substantially attenuated at the nearest downstream impoundment or tributary on each channel.~~***However, during the life of the mine this change is expected to be minor and would be negligible in comparison to existing factors that control sediment conditions in the***

drainages, such as impoundment or tributary contributions. After mining, erosion and sedimentation may occur immediately downstream of the proposed end lakes as a result of altered sediment load and energy dynamics.

Although it is difficult to quantify the number and extent of impacts to waters of the U.S. including wetlands on a regional level, ~~it is assumed~~ ***the USACE has determined*** that a net gain of waters of the U.S., including wetlands, would occur as a result of past, present, and reasonably foreseeable future actions. This gain is attributed, in part, to the creation of Lake Bastrop and Alcoa Lake, which substantially increased the acreage of jurisdictional waters of the U.S., including wetlands, within the cumulative effects area. This net increase would provide a beneficial effect to water quality through stormwater retention and increased runoff filtration.

Based on the anticipated minor and localized effect on sediment yields and associated substrates in receiving streams under the Proposed Action, the proposed project would not contribute to sediment-related cumulative effects for waters of the U.S.

Soils

A total of 8,654 acres of soils would be disturbed as a result of the Proposed Action. Potential adverse impacts resulting from soil erosion and slope instability would be controlled or prevented through implementation of erosion control, slope design, and reclamation measures. Reclamation would include the use of selected growth media, soil amendments, and revegetation practices that have been demonstrated to be effective under similar conditions at the existing Sandow Mine. Accelerated erosion and sedimentation are not anticipated due to the nature of the reclaimed growth media and Alcoa's commitment to implement measures to control erosion and sedimentation through concurrent reclamation, Best Management Practices, and long-term revegetation. Approximately 722 acres of end lakes would be constructed during reclamation. No prime farmlands would be affected as result of end lake development; however, long-term impacts to native soils would result. Approximately 56 acres of prime farmland temporarily would be affected as a result of other activities associated with mine construction and operation.

Surface disturbances resulting in the removal or disturbance to native soils within the cumulative effects area would be associated with Sandow and Powell Bend Mines; clay mining operations in the Butler and Elgin area; the Rockdale, Lost Pines 1, and Sim Gideon power generating stations; and the proposed Three Oaks Mine. A combined total of approximately 27,218 acres of native soils would be removed or disturbed within the cumulative effects area. Of this total, a maximum of approximately 23,132 acres have been or would be revegetated. The remaining acreage has been or would be ***primarily*** reclaimed as ponds and end lakes, resulting in a cumulative loss of approximately ~~3,274~~ ***3,267*** acres of native soils through conversion of these lands to water features.

Vegetation

A total of 8,654 acres of vegetation in five plant communities, excluding small areas occupied by residences, roadways, and other existing disturbances, would be disturbed incrementally in the short-term following implementation of the Proposed Action. A total of approximately ~~825~~ ***817*** acres, primarily associated with

end lakes, would be converted from upland vegetation to surface water resources in the long term; the remainder of the disturbance area would be revegetated. Successful reclamation and implementation of the recommended invasive plant species controls would reduce the potential for impacts associated with invasive species.

No impacts have been identified for any federally or state list species or their habitats or any species of special concern as a result of mine-related development, water level changes, or discharges.

Under the Three Oaks without SAWS cumulative scenario, surface disturbances resulting in the removal of vegetation within the cumulative effects area include the Sandow and Powell Bend Mines; clay mining operations in the Butler and Elgin area; the Rockdale, Lost Pines 1, and Sim Gideon power generating stations; and the proposed Three Oaks Mine. A combined total of approximately 27,218 acres of vegetation would be removed within the cumulative effects area. Of this total, a maximum of 23,132 acres have been or would be revegetated, with the remaining area reclaimed ***primarily*** as ponds and end lakes. Based on a combined 188 acres of previously existing water features, there would be a cumulative loss of approximately ~~3,274~~***3,267*** acres of vegetation as a result of conversion of these lands to water features.

Water discharge from the Three Oaks Mine would augment flows in Big Sandy, Middle Yegua, and Chocolate Creeks approximately 4 to 6 miles downstream of the discharge points resulting in the establishment of riparian vegetation due to increased water availability. This augmentation temporarily would offset the progressive loss of riparian vegetation resulting from the cessation of discharges from the Sandow Mine in East Yegua and Walleye Creeks. Following the cessation of Three Oaks Mine discharges in approximately 2030, and with continued drawdown in the Simsboro aquifer from municipal pumpage, there would be a progressive loss in riparian vegetation associated with the drainages within the 20-foot drawdown area of the Simsboro outcrop.

Under the Three Oaks with SAWS cumulative scenario, surface disturbance to vegetation within the cumulative effects area for the Three Oaks Mine and impacts associated with water level declines would be the same as discussed for the Three Oaks Mine without SAWS cumulative scenario. The effects from water discharge also would be similar; however, with the implementation of SAWS, flow augmentation from the mine and the resulting effects would occur earlier (starting in year 2013).

Under the SAWS without Three Oaks cumulative scenario, surface disturbance to vegetation within the cumulative effects area and the impacts associated with water level declines would be the same as discussed for the Three Oaks without SAWS cumulative scenario, minus the impacts from the proposed Three Oaks Mine. Riparian vegetation along Big Sandy and Middle Yegua Creeks would not benefit from water discharged from the Three Oaks Mine.

Fish and Wildlife Resources

Implementation of the proposed project would include the phased (over the 25-year life of the mine) direct disturbance of 8,654 acres of land, most of which currently offers some value as wildlife habitat. Wildlife habitat incrementally would be recreated throughout most of this area as concurrent reclamation proceeds behind the mining operations. Impacts to wildlife would include direct mortalities from construction activities,

incremental habitat fragmentation, animal displacement, increased noise, additional human presence, and the potential for increased vehicle-related mortalities. Incremental short-term habitat loss through the life of the mine could affect big game, upland game birds, waterfowl, raptors, songbirds, and amphibians and reptiles. The limited amount of habitat affected, relative to that available in the surrounding area, is not expected to result in substantive population reductions of any local wildlife species. These populations would be expected to recover following mine reclamation.

Mine-related water level changes in the 20-foot drawdown area of the Simsboro outcrop would reduce the amount and extent of surface water and associated riparian and wetland habitats of springs, seeps, and intermittent stream reaches with perennial pools within the effected area that are used by a variety of wildlife. Potential reduction or loss of available water could affect wildlife resources as a result of: 1) a decrease in available water for consumption; 2) loss of breeding, foraging, and cover habitats; 3) reduction in regional carrying capacity; and 4) displacement and loss of animals. The extent of these effects would depend on the species' use of the affected area and their relative sensitivity, the extent of habitat reduction, and the availability of similar habitats in the area. These effects temporarily would be offset during the life of the mine as a result of mine-related water discharge which would increase water availability and riparian habitat downstream of the discharge points during the life of the mine.

The new power line segments and associated substation would increase the collision potential for migrating and foraging bird species that occur within the permit area by a small increment due to the increased route length. In addition, the relocated 14.4-kilovolt (kV) power line and new 25-kV power lines would pose an electrocution hazard for raptor species attempting to perch on the structures. The USACE is evaluating potential mitigation to address these impacts.

Potential impact to the federally endangered Houston toad could include incremental habitat loss if mine-related discharge to Middle Yegua Creek reaches the floodplain that bisects the Carrizo outcrop. However, based on the lack of appreciable amounts of suitable Houston toad habitat within the alluvial floodplain and the potential for flow alteration at the Carrizo outcrop, potential impacts to the Houston toad, if present, would be anticipated to be low. No impacts to any other federally listed or proposed or federal candidate species would occur as a result of the proposed project. Project development has the potential to directly affect two Texas state listed species (timber/canebrake rattlesnake and Texas horned lizard); however, based on Alcoa's committed environmental protection measures for these species, these impacts are anticipated to minimal.

Surface disturbance would affect aquatic communities by incrementally removing approximately 38 miles of intermittent/ephemeral streams, approximately 38.5 acres of on-channel ponds, and approximately ~~31.4~~***38.6*** acres of isolated stock ponds during the life of the mine. Aquatic communities affected by this habitat loss would include macroinvertebrates, periphyton, and fish species that occur seasonally in intermittent/ephemeral reaches and year-round in perennial pools. The duration of impacts would be approximately 20 to 22 months in each phased-disturbance area. The loss of some intermittent/ephemeral reaches would occur throughout the life of the mine.

Water level changes within the 20-foot drawdown area of the Simsboro outcrop would result in aquatic habitat reductions in Big Sandy and Middle Yegua Creeks for macroinvertebrates, periphyton, and fish.

However, this impact temporarily would be offset by water discharges from the Three Oaks Mine, resulting in increased habitat for aquatic communities below the discharge points during the life of the mine. Riffle and run habitat would be added to the existing perennial pool habitat. Additional aquatic species may colonize the areas with more persistent flow.

Cumulative impacts on wildlife species under the Three Oaks without SAWS cumulative scenario would result from surface disturbance, water level changes, and water discharges. Proposed surface disturbance within the cumulative effects area would include the incremental loss of approximately 23,218 acres, of which approximately 23,132 acres would be reclaimed as fish and wildlife habitat, pastureland, cropland, and undeveloped lands. Based on a combined ~~188~~ ***195*** acres of previously existing water features, there would be a net cumulative increase of ~~3,274~~ ***3,267*** acres of aquatic habitat. These reclaimed lands would contribute to post-mining wildlife habitat. Overall, cumulative impacts would parallel those discussed above for the proposed project. Consequently, cumulative impacts to wildlife resources including sensitive wildlife resources (i.e., special status species and species of special concern) that potentially could occur within the cumulative effects area would include habitat loss or alteration, fragmentation, animal displacement, and direct mortalities from construction activities.

The projected water level change from mining activities and municipal pumping would result in a cumulative reduction in the amount and extent of available surface water and associated riparian, wetland, and mesic habitats for area wildlife. Potential loss or reduction of available water and riparian and wetland communities could result in the loss of cover, breeding, and foraging habitats; reduction in available water for consumption; increased animal displacement and loss; reduction of overall biological diversity; reduction in the area's carrying capacity; and possible population declines. Continued pumping by municipalities and other users beyond closure of the Three Oaks Mine would adversely affect surface water and riparian and wetland habitats that receive baseflow from the Simsboro outcrop in the cumulative effects area. However, these cumulative effects would be offset by the development of approximately 1,667 acres of streams, ponds, and end lakes in the reclaimed areas of the Three Oaks and Sandow Mines, as well as the reclamation of riparian habitats within the mine areas. The cessation of Sandow Mine discharges would end artificial flow augmentation and return East Yegua and Walleye Creeks to their original intermittent/ephemeral regime. Potential effects from the cessation of these artificial flow augmentations would result in the reduction of existing surface water features as well as the incremental long-term reduction of riparian habitat for wildlife. These potential effects would be somewhat offset by surface water discharges from the Three Oaks Mine to the Big Sandy Creek and Middle Yegua Creek drainages until approximately year 2030, when the discharges would end.

Potential cumulative effects to wildlife and their habitats from surface disturbance under the Three Oaks Mine with SAWS cumulative scenario would be the same as described above for the Three Oaks without SAWS cumulative scenario. Potential cumulative impacts from water level change also would be the same as discussed above for the Three Oaks Mine without SAWS scenario; however, the implementation of SAWS would result in different patterns of temporal reduction relative to surface water. Prior to 2013, the potential impacts of water level change on surface water as well as riparian and wetland habitats along Big Sandy and Middle Yegua Creeks temporarily would be offset by discharge contributions from the Three Oaks Mine. However, after year 2013, flow augmentation to the creeks would cease, and cumulative water level changes resulting from groundwater pumpage for SAWS, local municipal use, and other local uses

would continue to reduce the amount of surface water as well as riparian and wetland habitats for area wildlife.

Under the SAWS without Three Oaks cumulative scenario, the Three Oaks Mine would not contribute cumulatively to habitat impacts associated with surface disturbance or water level changes. The impacts of municipal and SAWS-related pumpage on water levels, and the associated effects to habitat, would be similar to those described above for the Three Oaks with~~out~~ SAWS cumulative scenario. However, since there would be no water discharges from the Three Oaks Mine, there would be no temporary offset in the effects of water level changes on local water resources.

Cumulative impacts on aquatic species under the Three Oaks without SAWS cumulative scenario would result from surface disturbance, water level changes, and water discharges. Quantifiable impacts to aquatic habitats as a result of surface disturbances associated with interrelated actions have been evaluated. Disturbance to-date at the Sandow Mine has resulted in the removal of approximately 83.3 acres of pond and intermittent/ephemeral stream habitat. Ongoing disturbance at Sandow and future disturbance at Three Oaks incrementally would remove additional aquatic habitat consisting of intermittent/ephemeral streams (approximately 33 acres) and ponds (approximately 95 acres). Loss of these types of habitat would result in the elimination of macroinvertebrates, periphyton, and possibly nongame fish species during mining. Reclamation at these sites, as well as the development of aquatic habitats in association with other interrelated actions, would result in a net increase in pond/lake habitat (approximately ~~3,274~~***3,267*** acres) and the replacement of some of the intermittent/ephemeral reaches, which would be recolonized by aquatic species. After reclamation is completed at these mines, slight reductions in runoff could occur downstream of the end lakes, which could result in relatively small flow reductions in the Big Sandy, East Yegua, and Middle Yegua drainages. As a result, slight reductions in aquatic species' abundance could occur in these drainages. Cumulative water level changes also would result in reduced aquatic habitat due to flow reductions in the Big Sandy drainage, with reduced populations of aquatic species. The cessation of water discharges from the Sandow Mine would end artificial flow augmentation and return East Yegua and Walleye Creeks to their original intermittent/ephemeral regime. Flows in Middle Yegua Creek would not be affected by the end of the Sandow Mine discharges until after approximately year 2030, when water discharges from the Three Oaks Mine would end. Until 2030, water discharges from Three Oaks would augment flows and increase aquatic habitat in Middle Yegua and Big Sandy Creeks, as discussed under the Proposed Action.

Potential cumulative impacts to aquatic species for the Three Oaks with SAWS cumulative scenario generally would be similar to the types of impacts in the upper portions of the drainages as discussed above for the Three Oaks Mine without SAWS cumulative scenario. The effects of water level changes on aquatic habitat also would be similar, except there would be a wider regional impact area that would extend northward along the Simsboro outcrop. However, flow augmentation would not occur under this scenario after 2013, which would result in an earlier reduction in aquatic habitat below the discharge points in the Big Sandy and Middle Yegua drainages.

Impacts on aquatic species under the SAWS without Three Oaks cumulative scenario primarily would relate to flow changes. Under this scenario, the Three Oaks Mine would not contribute cumulatively to the removal of existing surface water features, watershed modifications, or water level changes. Aquatic habitat would

be reduced in Big Sandy and Middle Yegua Creeks due to non-mine-related water level changes in the 20-foot drawdown area of the Simsboro outcrop, which would reduce aquatic species' abundance. Since there would be no water discharges from the Three Oaks Mine, there would be no temporary offset in the effects of water level changes on local water resources.

Paleontological Resources

Based on the type and prevalence of the paleontological resources associated with the Calvert Bluff Formation, the potential for adverse impacts as a result of mine development would be minimal.

Based on the existing and ongoing disturbances at the existing Sandow Mine and local clay pits, the Three Oaks Mine would result in a minor incremental increase in impacts (i.e., loss of context, scientific information, and educational value) to paleontological resources associated with the Calvert Bluff Formation. However, based on the prevalence of these paleontological resources in the region, these effects are considered minor.

Cultural Resources

Implementation of the Proposed Action would result in direct disturbance to 134 cultural sites, including 4 of the 5 sites which have been determined ~~by the Texas Historical Commission (THC)~~ to be eligible ~~to~~ ***for*** the National Register of Historic Places (NRHP). Visual impacts would occur at the fifth NRHP-eligible site. The remainder of the sites are either undergoing further evaluation or testing, prior to subsequent review and evaluation by the ***USACE and the Texas Historical Commission (***THC***)***, or have been determined ~~by the THC~~ to be ineligible for inclusion in the NRHP. Final ***NRHP eligibility*** determination ~~by the THC~~ on all sites currently undergoing testing or additional review would need to be completed prior to ground-disturbing activities in the vicinity of these sites. Site protection or treatment plans also would need to be implemented and completed at all sites determined ~~by the THC~~ to be eligible ~~to~~***for*** the NRHP, if the sites cannot be avoided. In addition, no disturbance to cultural sites would occur without prior written approval by the ***USACE,*** THC and RRC.

Approximately 150 acres within the mine area have not been surveyed to-date. Surveys and cultural resource review would need to be completed for this area prior to ground-disturbing activities in the vicinity.

Surface disturbance resulting in impacts to cultural resources within the cumulative effects area would be associated with clay mining operations in the Elgin and Butler area, the Sandow Mine, and the proposed Three Oaks Mine. Although difficult to quantify, cumulative impacts to cultural resource sites would include natural impacts (i.e., erosion and dilapidation), as well as direct disturbance and removal of cultural sites that were located, or are currently located, within the ~~interrelated actions'~~ ***cumulative effects disturbance*** area~~s of disturbance~~. However, all NRHP-eligible sites at the Three Oaks Mine would be ***avoided,*** mitigated***, or protected*** in accordance with site protection or treatment plans in coordination with the THC, USACE, and RRC, thereby minimizing direct cumulative impacts to cultural resources. Based on the distance between the~~ interrelated actions~~***clay mining operations, Sandow Mine, and Three Oaks Mine***, no cumulative visual impacts to cultural resources are anticipated.

Air Quality

Construction and operational activities at the proposed Three Oaks Mine would be sources of total suspended particulate and particulate matter of less than 10 and 2.5 microns in diameter and would affect air quality in the vicinity of the mine. Fuel-burning mobile (on road and off road) sources would emit low levels of gaseous pollutants (e.g., sulfur dioxide [SO_2], nitrogen oxides [NO_x], carbon monoxide, and volatile organic compounds [VOCs]). Storage tanks for fuels, oil, and chemicals are potential sources of VOCs. Based on the results of dispersion modeling, the spatial extent of impacts is expected to be less than 7 kilometers (4 miles) from the mine boundary. The USACE is considering mitigation measures (i.e., selective berm placement or relocation of the mine area boundary or roads) to ensure that Ambient Air Quality Standards are met. Levels of gaseous air contaminants and particulates are anticipated to remain well below levels determined to be detrimental to public health. There would be no air quality impacts on Class I areas due to the operation of the Three Oaks Mine, since there are no PSD Class I areas (areas where very little deterioration of air quality is allowed) within 100 kilometers (approximately 60 miles) of the mine.

Cumulative impacts to air quality would include impacts from the proposed Three Oaks Mine, impacts from nearby existing and proposed industrial or mining operations, and impacts from background emission sources including natural sources such as windblown dust and manmade sources such as public traffic on paved and unpaved roads. Emissions of all criteria pollutants except NO_x and SO_2 in the five-county area are predominantly from mobile road sources, non-road mobile sources, and area sources.

The two largest sources of particulate emissions are fugitive dust and agriculture, which account for over 92 percent of all particulate emissions. Fugitive dust emissions from the Sandow Mine will diminish as the operations there are phased out. When impacts from other sources in the area are added to the new emissions at the Three Oaks Mine, the resultant cumulative particulate matter impacts are expected to be less than the existing impacts near the Sandow Mine, which are well below state and federal standards.

The largest point sources of gaseous pollutants in the region are the power plants and smelter at the Rockdale operations in Milam County. These Alcoa facilities are being upgraded to reduce particulate matter, NO_x, and SO_2 emissions. The proposed Three Oaks Mine would have minor incremental impacts from gaseous pollutants since the mine would contribute only a small fraction of such pollutants compared to these and other mobile and non-mobile sources in the area.

Land Use and Recreation

Approximately 8,654 acres of the permit area would be disturbed over the 25-year life of the proposed project. Nearly 75 percent of the total (6,466 acres) would be disturbed for the mine itself; approximately 640 acres would be disturbed at any one time due to sequential backfilling of the pits and concurrent reclamation. Existing uses of the disturbance area, including agriculture, temporarily would be interrupted for the life of the mine, although all except the area actually disturbed at any particular time would remain rural in character. Post-mine land uses would be similar to existing land uses. There are no state or local land use plans or regulations that would apply to the Three Oaks project area.

The proposed Three Oaks Mine would have minimal effects on recreation resources. There are no existing public recreation facilities in the permit area. The small amount of private recreation that now occurs would be precluded from the disturbance area for the life of the mine; it would be displaced to other public or private lands in the area; however, this would have minimal effects on recreation resources in the region.

Cumulatively, land disturbance at the Three Oaks Mine would be offset in the short-term by reclamation of the Sandow Mine for rural uses, primarily improved pasture. Long-term, reclamation at Three Oaks would reinforce the existing rural character of the area and would tend to offset urbanizing pressures in the area. Mine-related as well as municipal and SAWS pumpage could adversely affect area wells; however, SAWS has committed to comply with RRC well mitigation requirements that apply to lignite mining, including the Three Oaks Mine, so adverse effects would be mitigated. There would be slight cumulative reductions in local agricultural production due to the combined effects of the Three Oaks Mine, the proposed regional habitat conservation plan, and the proposed utilities habitat conservation plan. Cumulative effects on recreation would be unlikely.

Social and Economic Values

The Proposed Action would employ approximately 150 contract workers during construction. Approximately 210 permanent employees and 50 contract workers would be employed during operation of the project. The operating work force would be transferred from the existing Sandow Mine and would not measurably affect the population of the study area. Project-generated personal income also would track trends established at Sandow, so the combined opening of the Three Oaks Mine and closure of the Sandow Mine would have no measurable effect of total study area income. The proposed project would increase mine-related tax revenues to Lee and Bastrop Counties, while the closure of the Sandow Mine would lead to diminished tax revenues in Milam County. These changes would be accompanied by only very minimal changes in demand for public services, as the population largely would remain in their existing locations. While this would affect local county governments (positively for Lee and Bastrop Counties and adversely for Milam County), it would have little or no effect on public schools, as the changes in local tax revenue to the independent school districts would be offset by changes in state financial support. Project-related effects on property values likely would be minor and temporary. Residential properties in close proximity to the mine disturbance area may experience a short-term decline in property values while the actual mining is taking place nearby; however, their values should rebound as the mining moves farther from them and reclamation is implemented.

Cumulative effects of the Three Oaks Mine and other reasonably foreseeable future projects would be minimal to non-existent. Employment increases, if any, from overlap with closure of the Sandow Mine would be very small and very short-term. Tax revenue increases to local jurisdictions from the Three Oaks Mine and non-mine-related population growth would offset increased service demands generated by that increased population.

Transportation

The Proposed Action would increase peak hour traffic on farm-to-market (FM) 696 from approximately 226 vehicle trips to 421 trips; however, the increase would be offset by substantial roadway improvements.

While it is not possible to quantify the net effect of the project on highway safety, it is expected that the roadway improvements would offset any added risk from project-related traffic increases. County and state roadway reroutes would increase some travel distances and reduce others. The net effect on major routes would range from an increase of 1.1 miles to a decrease of 1.1 miles. Resulting delays in travel times for some routes would be offset to a degree by improvements to the roadways.

Cumulatively, traffic increases from the Three Oaks Mine and from non-project-related population growth may adversely affect FM 619 to a very small degree and would degrade the level of service on FM 696. Traffic levels would not exceed the capacity of the roadway, however. Widening of U.S. Highway 290 may attract a small amount of additional traffic on FM 696; however, any effects would be very minor. No other reasonably foreseeable future actions would be expected to adversely affect area transportation conditions.

Noise and Visual Resources

Construction noise from the proposed mine would not exceed the U.S. Department of Housing and Urban Development (HUD) 65 decibels on the A-weighted scale (dBA) (acceptable day-night average noise level [L_{dn}]) standard at sensitive receptors in the study area, although it would raise noise levels above ambient background levels during daytime hours at a few residences in the Willow Creek subdivision and near FM 619. There are a few instances where individual project-related noise sources would exceed the HUD 65 dBA (L_{dn}) standard at sensitive receptors in the study area during operation of the proposed Three Oaks Mine. This would occur primarily during year 1 for residences outside the mine disturbance area and in years 6 through 25 for the 2 private residences on inholdings within the disturbance area. The standard also would be exceeded if several sources were to operate simultaneously in close proximity to a residence. Exceedences likely would occur for periods of a few days to a few months at any one location. The draglines, some of the loudest sources, would operate throughout the night, and they exhibit pure tonal qualities in their noise emissions. Pure tones are known to cause community annoyance when they stand out above base noise levels. Also, even though the projected exceedences above the HUD standard would be relatively few, the projected noise levels would be well above existing ambient background levels. The U.S. Environmental Protection Agency has concluded that sound level increases greater than 10 dBA often cause nearby community members to take vigorous action to oppose the presence of the noise source and complaints could be expected. This concern applies mainly to major noise sources operating at night, including draglines removing overburden, other heavy equipment operations, and trucks operating on the haul road.

The Three Oaks Mine would change the visual character of the permit area for the life of the mine. The greatest effects would be to the mine disturbance area with lesser effects in the permit area beyond the disturbance area. The effects would include views of the draglines ranging from close-up to several miles distant. The transportation and utility corridor would be a strong linear feature in the landscape for the life of the mine. There also would be changes in the landscape character as existing vegetation would be stripped off, overburden would be dug out and stacked temporarily, and lignite would be removed before the pits are backfilled with overburden from the next pit. The modifications would be short-term for the most part. Areas mined in the first years of the project would be revegetated to grasses within approximately 2 years and would be returned to essentially a similar landscape character as the pre-mining environment by the end of the mine's life. The remainder of the disturbed area would be progressively reclaimed as well following

completion of mining of each pit area. There also would be increased night lighting in the study area from the mine, and there would be long-term changes in linear features from realignment of several roads in the permit area.

Few, if any, cumulative noise effects would be anticipated from the Three Oaks Mine and other foreseeable future actions. Population growth in the study area would tend to raise background noise levels in the area; however, growth is expected to be modest and gradual during the life of the mine so cumulative noise effects would be minor. Long-term, reversion of the Three Oaks Mine disturbance area to rural character and land uses would tend to offset increased background noise levels from population growth. There may be very short-term cumulative noise level increases near U.S. Highway 290 during construction of road widening projects; however, the effects would depend on what, if any, mine activities are occurring nearby at the same time. No other reasonably foreseeable future actions would be expected to adversely affect study area noise levels.

Cumulative visual effects from the Three Oaks Mine and other reasonably foreseeable future actions would be minor. Foreseeable future activities only would have very minor visual effects. There would be a gradual shift in visual character of the area from the current rural character to a slightly more urban character with future population growth. During the life of the mine, the combined visual effects would be slightly greater than the effects of the mine alone. Following completion of mining and reclamation, the return of the Three Oaks Mine disturbance area to rural character would tend to offset the more urban effects of future population growth. Other reasonably foreseeable future activities would not occur in the same viewshed as the Three Oaks Mine and would not cumulatively affect visual character in the study area.

Hazardous Materials

Lignite mining at the Three Oaks Mine would involve the transportation, storage, and use of various hazardous materials. With the exception of fuels and lubricants, these materials would be used in small quantities. Fuels would be transported in the greatest volume and, thus, would pose the greatest risk of a spill. The analysis indicates that there would be a 5 percent chance of an accident resulting in a spill during the 25-year life of the project. All hazardous materials would be transported and stored in accordance with federal and state regulations. All hazardous wastes also would be stored, packaged, and manifested in compliance with applicable federal and state regulations. These wastes would be transported by approved transporters to licensed hazardous waste disposal facilities. The implementation of spill and emergency response plans would minimize potential impacts in the event of an accidental release of fuel or hazardous materials.

Cumulatively, the Three Oaks Mine would result in an incremental increase in the amount of hazardous materials being transported along the identified transportation routes. Due to the scheduled closure of the Sandow Mine shortly after initiation of mining at Three Oaks, the cumulative impacts due to the increase in hazardous materials traffic would be short-term. No cumulative impacts associated with the storage and use of hazardous substances are anticipated based on the proper implementation of spill prevention and emergency response plans. In addition, the Three Oaks Mine is not anticipated to result in cumulative impacts on the generation of hazardous waste.

Public Health

The proposed Three Oaks Mine is not anticipated to adversely affect the health of local residents. Potential mine-related impacts associated with water quality, air quality, noise, and lighting effects were evaluated. Specifically, the impact assessment addressed the potential effects of trace metals in the lignite, dust generated by mining operations, effects of chemical constituents used during mine reclamation, and the effects of increased noise and night lighting from mine operation.

Environmental Justice

Minority populations in the vicinity of the Three Oaks Mine permit area do not surpass the population thresholds specified in federal guidelines that would trigger environmental justice concerns. Consequently, no disproportionate adverse effects on minorities have been identified. An extensive effort was made to disseminate information on the project and solicit public comments from all interested parties in a non-discriminatory manner.

ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standards
ABA	***acid base accounting***
AML	***Abandoned Mine Land***
APLIC	Avian Power Line Interaction Committee
AQCR	Air Quality Control Region
BACT	Best Available Control Technology
BEG	Bureau of Economic Geology
BLM	Bureau of Land Management
BMP	Best Management Practices
BNSF	Burlington Northern Sante Fe
BPA	Bonneville Power Administration
BTU	British thermal unit
BTU/lb	British thermal unit per pound
C	Celcius
CAA	Clean Air Act of 1990
CAAA	Clean Air Act Amendment
CCW	***coal combustion wastes***
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CPS	City Public Service
CR	County Road
CWA	Clean Water Act of 1972
dBA	decibels on the A-weighted scale
dbh	diameter breast height
DL	***detection limit***
EHA	Espey Huston and Associates, Inc.
EIS	Environmental Impact Statement
EMS	Emergency medical services
EPCRA	Emergency Planning and Community Right-to-Know Act
ERP	extended responsibility period
ESA	Endangered Species Act
ETJ	***extraterritorial jurisdiction***
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FFC	***fossil fuel combustion***
FHWA	Federal Highway Administration
FM	Farm-to-Market
FOB	***freight on board***
FR	***Federal Register***

GAM	***Groundwater Availability Model***
gpm	gallons per minute
GTE	General Telephone and Electronics Corporation
HAP	hazardous air pollutant
HCP	habitat conservation plan
HUD	U.S. Department of Housing and Urban Development
Hz	Hertz
ISD	independent school district
KOP	key observation point
kV	kilovolt
lbs/ac/yr	pounds per acre per year
LCRA	Lower Colorado River Authority
L_d	day average sound level
L_{dn}	day-night average noise levels
L_{eq}	equivalent continuous sound level
L_n	night average sound level
LPGCD	***Lost Pines Groundwater Conservation District***
LOM	Life-of-mine
LOS	level of service
MACT	Maximum Achievable Control Technology
$\mu g/m^3$	micrograms per cubic meter
µm	micrometers
MAL	***maximum analytical level***
MCL	***maximum contaminant level***
mg/l	milligrams per liter
MMBTU	million British thermal unit
MMCFD	million cubic feet per day
MOA	memorandum of agreement
mph	miles per hour
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves and Repatriation Act of 1990
ND	***not detected***
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGS	National Geographic Society
NGVD	National Geodetic Vertical Datum
NH_3	ammonia
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_3	nitrate
NOAA	National Oceanographic and Atmospheric Administration

NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NTU	nephelometric turbidity unit
NWI	National Wetland Inventory
O_3	ozone
OHWM	ordinary high water mark
OPA 90	Oil Pollution Act of 1990
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining
Pb	lead
PHC	probable hydrologic consequences
PLS	pure-live-seed
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
ppm	parts per million
ppmv	part per million by volume
PRB	***Powder River Basin***
PSD	Prevention of Significant Deterioration
RECON	Regional Environmental Consultants
RCRA	Resource Conservation and Recovery Act
ROW	right-of-way
RRC	Railroad Commission of Texas
RUSLE	Revised Universal Soil Loss Equation
RWHA	R. W. Harden & Associates, Inc.
SAR	Sodium adsorption ratio
SARA	Superfund Amendment and Reauthorization Act
SAWS	San Antonio Water System
SCS	Soil Conservation Service
SH	state highway
SI	System International
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SR	State Route
TAC	Texas Administrative Code
TAS	Turpin and Sons, Inc.
TASS	Texas Agriculture Statistics Service
TAMU	Texas A&M University
TBCDS	Texas Biological and Conservation Data System
TCEQ	***Texas Commission on Environmental Quality (formerly TNRCC)***
TCLP	***Toxicity Characteristic Leaching Procedure***

TDA	Texas Department of Agriculture
TDS	total dissolved solids
THC	Texas Historical Commission
TLV	Threshold Limit Value
TNRCC	Texas Natural Resource Conservation Commission (***now TCEQ***)
TOS	Texas Ornithological Society
TPDES	Texas Pollutant Discharge Elimination System
tph	tons per hour
TPWD	Texas Parks and Wildlife Department
TRB	Transportation Research Board
TRI	***Toxic Release Inventory***
TSHA	Texas State Historical Association
TSP	total suspended particulate
TUFCO	Texas Utilities Fuel Company
TVA	Tennessee Valley Authority
TWA	Time-Weighted Average
TWDB	Texas Water Development Board
TWRI	Texas Water Resources Institute
TxDOTS	Texas Department of Transportation
TXU	Texas Utilities
umhos/cm	micromhos/centimeter
UPSP	Union Pacific Southern Pacific
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTSA	University of Texas at San Antonio
VERP	Voluntary Emission Reduction Permit (Texas)
VOC	Volatile Organic Compounds

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describes the environmental consequences of implementing the Proposed Action and the No Action Alternative.

1.1 Project Setting

1.1.1 Project Location

The proposed Three Oaks Mine would be located approximately 5 miles east of Elgin, Texas, and 11 miles southwest of Lexington, Texas (**Figure 1-1**). The permit area would be southwest of and adjacent to Alcoa's existing Sandow Mine permit area and located approximately 17.5 miles southwest of existing industrial facilities at Rockdale (i.e., the Alcoa/Texas Utilities [TXU] Rockdale power generating station and the Alcoa Rockdale aluminum smelter).

1.1.2 Existing Rockdale Facilities

The existing facilities near Rockdale include the Sandow Mine, Rockdale power generating station, and Alcoa's Rockdale aluminum smelter (**Figure 1-3**). All of these existing facilities currently operate, and can continue to operate, under their existing regulatory approvals.

1.1.2.1 Sandow Mine

Alcoa's Sandow Mine is located northeast of the proposed Three Oaks Mine; the Sandow Mine has been in operation since the 1950s. The Sandow Mine currently supplies fuel for the Rockdale power generating station, with approximately 6.2 million tons of lignite mined each year. The total permitted surface disturbance at the Sandow site is 15,10~~3~~***8*** acres, including 178.4 acres of waters of the U.S., composed of approximately 471,000 linear feet of streams, 71.3 acres of ponds, and 60.6 acres of wetlands. Of the total disturbance, approximately 500 acres are disturbed at any one time based on sequential pit backfill and concurrent reclamation.

The Sandow Mine currently employs 210 full-time workers. Based on the remaining economic lignite reserves, ***mine closure and final reclamation are anticipated to begin in 2003.***~~active mining is anticipated to continue through 2004.~~ A work force of approximately 25 contractors will oversee mine closure and intensive reclamation through 200**8**~~7~~. It is estimated that an additional 10 years will be required for final reclamation and bond release, using approximately 10 contractors.

In 2000, an average of 19,083 gallons per minute (gpm) was pumped from the Sandow Mine Area for dewatering and depressurization. Of this pumpage, 4,443 gpm were utilized for industrial use at the power generating facility, 9,056 gpm were discharged into East Yegua Creek, and 5,584 gpm were discharged into Walleye Creek. Following mine closure, ~~4,443 gpm~~ ***approximately 3,100 gpm (5,000 acre-feet per year)*** will continue to be pumped from the mine site to provide for ongoing industrial use.

1.1.2.2 Rockdale Power Generating Station

The existing Rockdale power generating station is located approximately 7 miles southwest of Rockdale, adjacent to the Sandow Mine. The power plant consists of three 120-megawatt (MW) units owned by Alcoa and one 595-MW unit owned by TXU. The power generating station, which occupies an approximately 100-acre site, currently provides electrical power for Alcoa's existing Rockdale aluminum smelter, located adjacent to the power generating station, and the TXU electrical grid system. Alcoa Lake, with a surface area of approximately 895 acres, provides cooling water for the Rockdale power generating station. The Alcoa and TXU stations currently employ 130 and 100 workers, respectively.

At full ***current*** capacity, the power generating units could use approximately 6 million tons of crushed lignite per year. Approximately ~~875,000~~ ***950,000*** tons of ash are produced per year, comprising ~~350,000~~ ***340,000*** tons of bottom ash and ~~525,000~~ ***610,000*** tons of fly ash. ~~Since 1998, a~~***A***pproximately 30 percent of the fly ash and ~~100~~ ***57*** percent of the bottom ash ~~has been~~ ***is*** recycled ***for commercial use. In addition,*** a portion of the bottom ash is currently used for road surfacing and ramp construction at the Sandow Mine. Fly and bottom ash to be recycled is transported offsite by ~~dump~~ truck. All non-recycled fly ash is transported by ~~dump~~ truck to a Texas Natural Resource Conservation Commission (TNRCC)[1]-approved landfill adjacent to the generating station and the Sandow Mine.

Alcoa has applied for air permits for its three 120-MW units under the Texas Voluntary Emission Reduction Permit (VERP) process. The VERP process applies to grandfathered emission sources, (i.e., sources that existed prior to the current air quality permit requirements). Control measures required to obtain a VERP can be 10-year-old best available control technology (BACT) or deferral of emission reductions with significant reductions of another pollutant. Alcoa submitted a VERP application for its three power plant boilers on July 6, 2001. The TXU power generation station is separately owned and permitted; thus, it is not part of Alcoa's VERP application. TNRCC notified Alcoa that the VERP application was administratively complete on August 10, 2001. In a September 7, 2001, letter to the TNRCC, Alcoa demonstrated the required VERP application public notice requirements. Alcoa ~~anticipates receiving~~ ***subsequently received*** a final VERP in ~~mid~~***late*** 2002.

The permit ~~application~~ includes a 50 percent reduction in nitrogen oxide (NO_x) emissions by ***the end of*** 2002 and a 90 percent reduction in sulfur dioxide (SO_2) emissions by ***March 1,*** 200~~6~~***7***; these reductions are from the 199~~7~~***8*** power plant emission inventory levels. Alcoa is currently evaluating technologies to achieve these emissions reductions. Alcoa's selection of emissions reduction technologies and schedule for implementing such modifications may be affected by recent U.S. Environmental Protection Agency (USEPA) and TNRCC reviews of the facility and associated findings of emissions violations. It is not possible to predict the consequences of these enforcement actions in relation to the proposed project at this time.

Alcoa submitted an application for an amendment to the VERP on November 1, 2002, in which Alcoa committed to further emissions reductions. These reductions included a NO_x reduction of 90 percent and a SO_2 reduction of 95 percent (based on the 1997 inventory). These reductions would

[1] ***Subsequent to preparation of the Three Oaks Mine Draft EIS, the Texas Natural Resource Conservation Commission (TNRCC) changed its name to the Texas Commission on Environmental Quality (TCEQ). Please note that TNRCC and TCEQ are used interchangeably throughout this EIS.***

be obtained by: 1) installing wet scrubbers on the existing boilers, 2) installing new Clean Coal Circulating Fluid Bed boiler technology, or 3) shutting down the old units no later than year-end 2007. An amendment to the air quality permit was submitted for the construction of two fluidized bed units. This application was declared administratively complete on November 20, 2002.

would be considered spoil with the scrubber technology. Thus, the aerial extent of mining would not differ significantly whether 6.2 or 7.0 million tons per year were mined. It should be noted that mining is not an exact science. Coal tonnage and overburden volumes are calculated from information obtained from drill holes spaced 500 to 1,000 feet apart. The actual quantity and quality of both the lignite and the overburden can vary somewhat from the projected values. This geologic variability combined with unexpected weather conditions and uncertain equipment availabilities make precise predictions regarding mine plans impossible.

1.1.2.3 Rockdale Aluminum Smelter

Alcoa's existing aluminum smelter, which has a smelting capacity of ~~330,000~~***260,000*** tons per year, was located at Rockdale in the early 1950s. The 275-acre facility is located immediately adjacent to the Rockdale power generating station, from which the smelter obtains its electrical power. The smelter currently employs ~~1,100~~***1,000*** workers. Alcoa applied for a ~~VERP~~ ***Flexible permit*** for the smelter in 199***8***~~9~~; ~~the VERP application is pending with TNRCC.~~***; Alcoa withdrew this permit application on December 27, 2002. In June 2003, Alcoa will apply for a permit under TCEQ's Existing Facility Permit Program.***

1.2 Purpose of and Need for Action

The USACE believes its decision to issue, issue with conditions, or deny Alcoa's Section 404 permit is considered a major federal action with the potential to significantly affect the quality of the human environment; therefore, the USACE is preparing this EIS to analyze the impacts of Alcoa's proposed project and reasonable alternatives.

The purpose of the proposed Three Oaks Mine is to provide a long-term, economically stable fuel supply for the existing Rockdale power generating station, which supplies power for Alcoa's Rockdale aluminum smelter. This need is currently being met by lignite mined from the existing Sandow Mine. However, mining at the Sandow Mine is approaching the limits of safe operation and economic viability, as mine pits have advanced to depths where additional long-term production is too costly (based largely on overburden depths to be excavated and volume of groundwater to be handled) to sustain the generating station. As a result, Alcoa must secure a new economically viable fuel source.

The Rockdale power generating station consists of three 120-MW units owned by Alcoa and one 595-MW unit owned by TXU, which provide power for Alcoa's existing Rockdale aluminum smelter as well as providing power to the TXU electrical grid system. Under Alcoa's current contractual agreement with TXU (extending through year end 2013), Alcoa supplies 4 million tons per year of lignite or the equivalent in western coal for the TXU generating unit at Rockdale. In the absence of a local lignite source, Alcoa would be obligated to install the required facilities to deliver western coal to this unit. If Alcoa did not provide the required coal, Alcoa would be in default on the Alcoa-TXU contract. Alcoa would have to provide the revenue (estimated at $14 million per year) in lieu of providing the fuel source for TXU's allocated 95 MW of power production per year for the remainder of the contract. Alcoa also would be responsible for the balance of the cost of capital (estimated at $12 million per year) on the TXU unit through the remainder of the contract (Hodges 2001). Based on the anticipated end of the economic life of the Sandow Mine (approximately 2004), failure to develop an alternate local lignite source likely would require major capital expenditures for fuel conversion of the generating units at Rockdale in order for these units to continue producing electricity; see Section 2.4 for additional information on alternative fuel sources.

contains the glossary. Chapter 8.0 contains the index. Copies of supporting documents are available for public review at the USACE Fort Worth District Office in Fort Worth, Texas.

Table 1-1
Other Environmental Permits

Federal	
U.S. Army Corps of Engineers	Clean Water Act Section 404 Permit
State of Texas	
Railroad Commission of Texas	Surface Coal Mining and Reclamation Permit
Texas ~~Natural Resource Conservation~~ Commission ***on Environmental Quality***	Clean Water Act Section 401 (Surface Water Quality) Certification Texas Pollutant Discharge Elimination System Permit Air Quality Permit (for coal crushing and conveyer facilities) Solid Waste Registration

Table 1-2
Other Requirements*, ~~and~~* Approvals*, and Coordination*

Federal	
U.S. Environmental Protection Agency	EIS Review
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 Consultation, Fish and Wildlife Coordination Act
Mine Safety and Health Administration (MSHA)	MSHA Identity Report Training Plan
Federal Communications Commission	Radio Station Authorization
State of Texas	
Texas Department of Health	Radioactive Material License
Texas Department of Transportation	Approval for Farm-to-Market Road Realignments
Texas Historical Commission	~~Compliance with~~ National Historic Preservation Act Section 106 Consultation **and**~~, Native American Graves Protection and Repatriation Act,~~ American Indian Religious Freedom Act~~, and Archaeological Resource Protection Act~~
Texas ~~Natural Resource Conservation~~ Commission ***on Environmental Quality***	Notification of Open Burning
Local	
Bastrop and Lee County Sheriffs	Notification of Open Burning
Bastrop County Commissioners Court	Approval for Bastrop County Road Realignments
Bastrop County Floodplain Administrator	***Approval for Floodplain Modifications***
Lee County Commissioners Court	Approval for Lee County Road Realignments
Lee County ***Floodplain Administrator***	~~Approval for Stream Channel Modifications Under National Flood Insurance Program~~***Approval for Floodplain Modifications***

CHAPTER 2
ALTERNATIVES
INCLUDING THE PROPOSED ACTION

Table 2-1
Summary of Alternatives Considered and Their Primary Attributes

Alternative	Advantages	Disadvantages	Reason for Eliminating from Consideration, if Applicable
Alternatives Considered in Detail			
No Action	• Eliminates Three Oaks Mine-related environmental impacts. • Eliminates emissions and discharges from Alcoa's aluminum smelter.	• Triggers adverse socioeconomic impacts through resultant smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations – retained as mandated under NEPA regulations.
Three Oaks Mine (Proposed Action)	• Maintains smelter operations and associated socioeconomic benefits.	• Triggers various adverse environmental impacts as discussed in detail in Chapter 3.0.	• Retained for analysis as the Proposed Action as it meets the purpose and need of the project.
Three Oaks Alternate Mine Plan (RRC-Approved Plan)	• ***Maintains smelter operations while road relocation issues are resolved.***	• ***Triggers environmental impacts similar to Proposed Action.***	• ***Retained for analysis as an alternate mine plan as it meets the purpose and need of the project.***
Alternatives Considered but Eliminated from Detailed Analysis			
Purchased Power for Smelter	• Eliminates Three Oaks Mine-related environmental impacts. • Eliminates emissions from Alcoa's three generating units.	• Associated economic costs and supply uncertainties would force smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations.
Western Coal for All Units	• Eliminates Three Oaks Mine-related environmental impacts. • Reduces emissions from Alcoa's three generating units.	• Anticipated conversion and transportation costs would force smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations.
Natural Gas for All Units	• Eliminates Three Oaks Mine-related environmental impacts. • Reduces emissions from Alcoa's three generating units.	• Conversion costs, fuel supply costs, and fuel cost instability would force smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations.
Deeper Mining at Sandow	• Eliminates or defers the need to develop a new lignite reserve.	• Geologic conditions are not conducive to deeper mining. • Groundwater pumpage and discharge would increase substantially.	• Operational costs and safety issues render this impractical.
Milam Reserve	• Would keep additional impacts closer to currently affected towns and communities.	• Would require greater environmental disturbance than at the Three Oaks Mine. • Not a consolidated reserve.	• Acquisition difficulties render this impractical.

and delivering lignite from the Three Oaks Mine is approximately $0.95 per MMBTU (Hodges 2001). Thus, the Powder River Basin coal alternative would represent a direct fuel cost increase of approximately 57 percent. The USACE has reviewed fuel cost estimates in relation to documented fuel costs at other sites in central and eastern Texas. The cost estimate for western coal used by the RRC (Walter and Blair 2000) is similar to and slightly below that derived by the USACE (see **Figure 2-1**). Other economic factors related to the use of this resource include:

- Capital cost of approximately $15 million to convert the TXU generating unit to western coal (Alcoa estimate);
- Capital cost of approximately $40 million to convert the three Alcoa generating units to burn western coal (Alcoa estimate);
- Transportation contracts are normally limited to 5 years and are adjustable based on variations in the price of diesel fuel;
- Loss of approximately 30 percent of output capacity for Alcoa's generating units operating on western coal that is not dried (Alcoa estimate);
- Most new contracts contain provisions that adjust the price to market every 5 years;
- Increase of approximately 30 percent in overall power production cost to operate a coal drying system, as currently used for lignite, to preserve the generating capacity of 120 MW per unit; and
- Existing costs for western coal would make smelting non-competitive, and future costs, especially those for transportation, are likely to increase.

As a result of the above factors, Alcoa has determined that this alternative would not meet the purpose and need of the project.

As discussed in Section 1.1.2.2, Alcoa plans a number of modifications to their three generating units as part of the VERP process. Additional modifications also may be implemented as a result of recent USEPA and TNRCC enforcement actions related to the facility. However, it is not expected that these modifications ***and capital expenditures*** would significantly alter the basic economic comparison between western coal and local lignite as the western coal price ***and*** transportation costs ***are the most significant issues, and they***~~, and infrastructure costs for unloading and handling facilities~~ would remain unchanged.

2.4.1.3 Natural Gas for All Units

If a pipeline were built capable of providing 85 million cubic feet per day (MMCFD) of natural gas to the Rockdale power generating units, and if economics otherwise justified the expenditure of $100 million in capital costs, the existing generating units could be converted to natural gas. There would be savings because of the minimal need for emissions controls and for ash disposal. However, additional factors considered by Alcoa included the following:

- Deregulation of wellhead natural gas prices and restructuring of interstate pipeline transportation have led to the establishment of a highly competitive and complex natural gas market that experiences marked short-term price fluctuations;

- The overall price of natural gas can be expected to increase in the future based on current trends; and

- Natural gas prices are expected to be higher and more unpredictable than lignite or western coal prices.

As a result, the overall cost of electricity from the existing power plants, even without the capital costs of conversion, would more than double due to the cost of the natural gas (as shown in **Figure 2-1** and **Table 2-2**), and continued smelter operation would not be considered viable by Alcoa (Hodges 2001). ***Data presented in Figure 2-1 and Table 2-2 from Alcoa 2001 and Walter and Blair 2000 are based on fuel costs prevalent in years 1999 and 2000. More recent cost data show natural gas costs almost doubling while lignite and western coal costs remained relatively static. For example, the peak natural gas price for electric utility customers in Texas reached $8.74 per MMBTU in January 2001, and the average for years 2000 and 2001 reached $4.36 based on data available at the U.S. Department of Energy, Energy Information Administration website: http://www.eia.doe.gov.***

2.4.1.4 Alternative Lignite Sources

There are extensive lignite reserves in Texas, and many lignite mines are operational (**Figure 2-2**). Thus, it would be possible for Alcoa to obtain Texas lignite from a location other than the Three Oaks Mine site. However, lignite has a relatively low heat content and as a result, a larger quantity is required to generate power, compared to western coal. Consequently, transportation costs would be relatively high; therefore, as a practical matter, lignite development is limited to mines that are very close to the customer. For the Rockdale power generating units, there are three potential mine sites (in addition to Three Oaks) that have been considered: 1) deeper mining at the existing Sandow Mine; 2) following the Sandow Mine lignite seams to the northeast in Milam County, rather than to the southwest to the Three Oaks Mine area; and 3) the Camp Swift area lignite reserve.

Deeper Mining at the Sandow Mine

Alcoa has been mining at Sandow for nearly 50 years. Nearly all of the lignite with less than 200 feet of overburden already has been mined. These lignite seams continue past the 200-foot depth line dipping toward the southeast. Theoretically, more lignite reserves could be acquired, and Alcoa could continue to mine at greater depths and supply fuel to the power plant for 30 more years.

Alcoa considers this not to be a viable option based on safety and economic considerations. Thousands of acres of new reserves would have to be acquired. Up to 400 feet of overburden would have to be moved. In excess of $100 million of capital would have to be invested in earth-moving equipment capable of achieving such deep mining (probably bucket-wheel excavators). Safety and slope stability would be a major concern in the unconsolidated overburden. All these factors would substantially increase operating costs, which likely would make Rockdale smelter operations non-competitive in the global market.

Rockdale
Rockdale West
Thorndale
Thrall
Alcoa Lake
Smelter
Power Plant
Milam County
Sandow Transportation and Utility Corridor
Sandow Permit Area
Williamson County
Lee County
Three Oaks Transportation and Utility Corridor
Lexington
Middle Yegua Creek
Stockpile/Blending Facility
Three Oaks Permit Area
Lignite Stockpile
Contractor Yard
Office and Facility Area
Three Oaks Mine Area
Lignite Stockpile and Area B Crusher
Proposed Disturbance Area
Lignite Stockpile
Lee County
Bastrop County
Big Sandy Creek
McDade
79
1786
487
77
2116
486
112
619
696
290
223

Notes:
Drainages and roads external to the study area have been simplified for presentation.

Figure revision: Added county boundaries; corrected Sandow transportation and utility corridor length.

N

0 1 2 Miles

Source: Adapted from Alcoa 2001c.

Figure 2-3
Proposed Three Oaks Mine Components

Three Oaks Mine

1/29/03

extracted would depend on the technology that Alcoa uses to achieve emissions reductions at its existing power units. Historically, the Sandow Mine has produced an average of 6.2 million tons of lignite per year, and a similar production rate would be expected at the Three Oaks Mine if scrubber technology were used for emission controls. However, if fluidized bed boiler technology were chosen, the modified units would be more tolerant of lower-grade high-ash lignite. In this case, it is likely that production would be on the order of 7.0 million tons per year; the overall generating capacity also would increase, which would provide more power for sale to the grid. As discussed in Section 1.1.2.2, the increase in lignite production would not substantially change the disturbance area, and it would result in a small reduction in the amount of overburden that is used in reclamation.

Two 102- to ~~155~~***115-***cubic-yard capacity draglines would be used to remove overburden and interburden (the material to be removed above and between the lignite seams, respectively) to allow access to the lignite seams. This method would involve both highwall and spoil side positions for the equipment, as currently utilized at Alcoa's Sandow Mine. No blasting is proposed. The volume of overburden and interburden production would vary with the depth to which mining would occur. Projected material production by year for the first 5 years and subsequent 5-year periods for the life of the mine is shown in **Table 2-6**, and the projected individual mining panels are illustrated in **Figure 2-4**.

Table 2-6
Production Schedule

Year/Period	Overburden/Interburden (million cubic yards)	Lignite (million tons)[1]
1	35.1	7
2	33.3	7
3	32.6	7
4	30.1	7
5	29.8	7
6-10	140.7	35
11-15	167.3	35
16-20	175.2	35
21-25	194.6	35
Total	**838.7**	**175**

[1]Production schedule assumes use of fluidized bed boiler technology at Alcoa's generating units.

Source: Hodges 2002c.

The mine plan illustrated in **Figure 2-4** includes three panels labeled Contingency Areas 1, 2, and 3. Contingency Areas 1 and 2 are included in the initial 5-year permit term. Exploration drilling has shown some of the lignite seams to be of marginal quality. Plans are to blend these higher ash seams with lower ash seams. If this blending operation proves to be unsuccessful, these higher ash seams would be disposed of as spoil and mining would have to cover a larger area to recover the tonnage required for the power plant. In other words, Alcoa may mine the areas labeled years 1 through 5 plus some of the Contingency Areas during the initial permit term. Similarly, the specific schedule for mining Contingency Area 3 would depend on actual coal seam quality encountered in later years during the second and third 5-year permit terms. For purposes of this environmental impact analysis, it is assumed that Contingency

Area 1 would be mined in year 5, Contingency Area 2 would be mined evenly during years 6 through 10, and Contingency Area 3 would be mined evenly during years 6 through 15.

Once an initial box pit is excavated, overburden and interburden from each subsequent pit would be backfilled into the previous pit to establish a graded surface at approximately the same elevation as the pre-mining surface. This surface would be suitable for completion of reclamation procedures currently in use at the Sandow Mine. These procedures would include rough grading, final grading, replacement of soils from prime farmland areas, testing of selectively handled overburden and interburden for suitability, seeding and planting, and other final reclamation tasks. The sequence of activities would be implemented to achieve land use and long-term reclamation goals as approved by permitting agencies prior to site construction.

The proposed permit area is located near the communities of Elgin, Butler, McDade, Beukiss, and Adina. None of these communities are located within the area proposed to be mined or within the area to be used for support facilities or infrastructure. However, several non-mine-related roads (county roads [CRs] and state roads) and utilities cross the proposed disturbance areas and would need to be relocated to facilitate mining. These roads and utilities are shown in **Figures 2-5, 2-6,** and **2-7** and identified in **Tables 2-7** and **2-8**.

During final stages of mine development and subsequent reclamation, additional reroutes would be required for some of these utilities. Final routes for some utilities may cross the mined area in close proximity to the original pre-mine pathway. Final routes for some utilities have not yet been designed or negotiated with affected landowners and utility companies. **Figure 2-8** shows the configuration of a proposed haul road crossing of a county road.

Both the land surface and the lignite resource located within the proposed mining area are or would be controlled by Alcoa prior to mining. Control would be established and maintained through lease from the current owners or through Alcoa ownership. Most lignite within the proposed mining area is owned by San Antonio CPS and was acquired with the intent of mining the lignite for power generation. Alcoa has leased these tracts from CPS. ***Currently there are three uncontrolled (not Alcoa owned or leased) parcels, the greater portions of which lie within the proposed mine area, all near the eastern side of the area to be mined. Using the property identification numbers show on Plates 136-A1 and 136-A2 from Alcoa's application to the RRC (Alcoa 2000 [Volume 6]), these parcels include from south to north T0150, T0130, and T085 (see Figure 3.9-1 in the Final EIS). Two parcels (T0150 and T0130) straddle the anticipated mine disturbance area boundary while the third (T085) lies entirely within the mine area. Two of these parcels (T085 and T0130) currently are occupied, and it is assumed for analysis purposes that they would remain occupied during mining operations. A fourth parcel at the southern end of the proposed mine area (T0165) has a small portion within the anticipated mine disturbance area boundary. In addition to these four uncontrolled parcels, Alcoa is joint owner of a parcel within the southern end of the transportation/utility corridor (T037) that currently is the subject of litigation. For purposes of this analysis, this latter property is shown as uncontrolled, pending resolution of the litigation. Alcoa expects that this litigation would result in the property being partitioned in kind, that is divided equally between Alcoa and the co-owners (Hodges 2003). Thus, the litigation is not anticipated to change the Proposed Action.***

Alcoa is working to acquire these properties, especially the three properties within the eastern portion of the area to be mined. It is assumed that the affected property at the southern end of the mine disturbance area (T0165) could be avoided. If the current litigation involving the jointly owned parcel within the southern end of the transportation/utility corridor is not resolved in a manner that enables Alcoa to construct these facilities as proposed, some realignment of this corridor could be required. If the properties within the mine area cannot be acquired, minor changes would be made in the area to be mined, including exclusion of these parcels, with appropriate buffers, from the mine area. Alcoa controls sufficient property within the permit area to make up for the lost tonnage by extending the mine area to the southeast. These potential changes, if they were to occur, would result in minor changes to the overall affected acreage, overburden volumes, dewatering and depressurization pumpage rates, post-mining contours (in the immediate vicinity of the excluded parcels), and shapes of the end lakes as currently described for the Proposed Action. In ~~T~~*t*he areas proposed for location of the support facilities and infrastructure**,** ~~also would be controlled by Alcoa prior to initiation of construction of these facilities; control would be~~ ***are controlled by Alcoa.*** ~~through direct ownership or lease~~***.***

These phases are not mutually exclusive, and various activities associated with each phase would occur concurrently in different portions of the mine area. The three phases are discussed in detail in the following sections.

2.5.1 Construction Phase

Upon receipt of all required local, state, and federal permits, Alcoa would commence construction of the mine. Construction activities and mine components developed during this phase are described below.

2.5.1.1 Surface Water Control Facilities

Surface water control facilities would be constructed prior to other components in order to control runoff from disturbance areas, including the initial mining area, support facilities, and infrastructure area. These facilities would include a combination of diversion ditches, sediment ponds, and other control structures or techniques designed to minimize erosion and control surface water quality discharged from the site (see **Figure 2-9**). Each structure would be planned and constructed according to requirements of the RRC and would utilize processes currently used at the existing Sandow Mine. ***Proposed sediment ponds, diversions, and outlet structures have been designed by a registered professional engineer in accordance with RRC and federal regulations. Pond capacities, flow rates, runoff volumes, and detention times were determined using the 10-year, 24-hour storm event. Additionally, each outlet structure was modeled and designed using the 25-year, 6-hour storm event to provide assurance that the facilities would be adequately sized to withstand and pass the peak flow from either storm event. The ponds would be located outside of the delineated 100-year floodplains and would not be subject to backwater effects from 100-year flows in the delineated floodplains. Spillway inverts would be located to prevent backwater from entering the pond from downstream flows. This would meet the requirements of the TCEQ modification 3 of the Draft TPDES Permit Number 04348 requiring that all wastewater treatment facilities be designed or located to protect against the 100-year frequency flood level. Pond and spillway designs are in compliance with current federal (30 CFR 816.46) and RRC regulations.*** Structures that would be constructed during this initial phase are identified below.

- Diversion ditches CD-1, DD-1, DD-2, DD-3 (Phase 1), DD-9a, and DD-9b.
- Sediment ponds SP-1, SP-2, SP-5; detention ponds DP-1, DP-2, DP-3; and facilities pond FP-1.

Other control structures or techniques that would be used include the following Best Management Practices (BMPs).

- Riprap channels.
- Check dams or low-sill weirs with plantings of wetland vegetation in the retention areas.
- Temporary vegetation in diversions.
- Booms (i.e., floating tubular devices with submerged curtain which route water in ponds) to prevent short-circuiting of surface water control facilities.
- Chemical treatment, as needed, to maintain receiving water quality.
- Managed discharges of sediment ponds to control flow.

Prime farmland topsoil and subsoil stockpiles anticipated to be left in place for more than 30 days would be marked and stabilized. Seeding and planting of stockpiled materials, which would be conducted in accordance with the project's Reclamation Plan, would be conducted no later than the first normal growing period. In addition, appropriate erosion control measures such as diversion channels and/or berms would be constructed around the stockpiles to prevent erosion from overland runoff. BMPs, such as silt fences or staked straw bales, also may be used to control sediment transport. Stockpile locations would be marked with signs identifying the material to prevent possible use of the material for other purposes.

2.5.1.5 Mine Utilities Construction

Electrical Power Supply

A 138-kV power transmission line and substation and three, single-pole 25-kV power distribution lines would be constructed to provide electric service to the mine facilities and operation. The 138-kV substation would be constructed within the Three Oaks Mine permit area adjacent to the haul road in the transportation and utility corridor and across from the area designated as the contractor yard (**Figure 2-*3*6**). The substation, which would be connected to existing utilities at the Sandow Mine through installation of a new 138-kV power line interconnect, would provide power for the proposed 25-kV power lines. One of the 25-kV power lines would be constructed between the substation and the stockpile/blending facility to feed the crusher, stacker, and reclaim and overland conveyors. A branched 25-kV line would be constructed southward from the substation. One branch would be constructed between the substation and the mine maintenance and office area. Additional branches would extend into the pit area to feed the two draglines and supporting dewatering systems. In addition, a short span would be constructed to provide power to the offices at the contractor yard.

Telephone Service

Telephone service would be provided to the facilities area of the Three Oaks Mine by extending phone lines from Sandow. These lines would be buried within the transportation and utility corridor as well as throughout the proposed facilities area, as needed.

Water Supply

Separate water supplies would be used at the Three Oaks Mine to service potable and non-potable needs. Potable water would be obtained from the local municipal water supplier. Alcoa plans to provide the water supply for non-potable uses from surface water runoff and dewatering and/or depressurization operations that would be constructed as part of the mining operation. Non-potable water would be required for various applications, including dust control on haul roads and within the lignite handling system, equipment and facilities wash-down, and fire sprinkler and fighting systems. The typical non-potable consumptive water use for the Three Oaks Mine would be approximately 600 to 800 gpm.

Water supply facilities for non-potable water would include pipelines, pumps, water storage tanks, elevated discharge structures for loading water trucks, and associated power supplies and control systems for each

Construction of the Three Oaks-to-Sandow haul road would require the installation of grade separators or at-grade crossings at the intersections of CR 304, CR 306, and CR 312 and the intersection of the proposed FM 619 reroute for the safe segregation of mine traffic and public traffic. At-grade crossings at the county roads would be constructed in accordance with the requirements of the Lee County Commissioners Court; the farm-to-market at-grade crossing would be in accordance with the requirements of the TxDOT. In addition, a bridge would be constructed at the Middle Yegua Creek crossing. The bridge would be constructed in accordance with the design requirements of the TNRCC and TxDOT. ***The bridge crossing would have concrete riprap along the abutments only, and the modified channel would be stabilized with vegetation.*** Diagrams of a typical ephemeral drainage crossing and the proposed bridge over Middle Yegua Creek are shown in **Figure 2-10**. Approximately 20 culverts would be placed under the Three Oaks-to-Sandow haul road at the minor drainage channels along this route.

A series of temporary equipment "walk-arounds" would be required along the haul road to facilitate relocation of the draglines across Middle Yegua Creek and public road grade separators. The walk-arounds would be constructed of compacted fill material and would provide equipment-crossing locations during construction of the haul road and protection of the road travel surfaces. Prior to placement of fill in the Middle Yegua Creek drainage, two 30-inch culverts would be installed to allow base flows to pass under the walk-around.

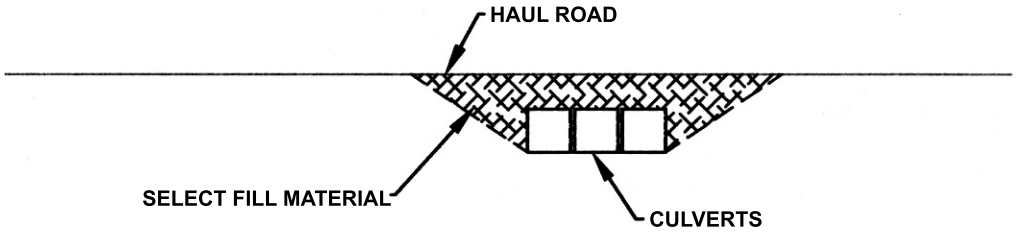
Sediment control measures, including silt fences and/or hay bales, would be utilized at the crossings. Once the equipment crosses the road or drainage, the material used to construct the walk-around would be removed and placed at the ends of the walk-around. The disturbed areas would be recontoured to match the original topography, stabilized, revegetated, and silt fences installed to reduce erosion and sedimentation. Approval would be obtained from TxDOT or the appropriate county for road crossings and from USACE for crossings of waters of the U.S. prior to construction of the walk-arounds. Alternate passage would be provided for the traveling public during the time that the roads would be blocked.

Conveyor

Alcoa has proposed an overland conveyor to transport lignite from the Three Oaks Mine to the power generation facility. The conveyor would be located in the transportation and utility corridor adjacent to the proposed Three Oaks-to-Sandow haul road described above and would be approximately 6 miles in length from the stockpile/blending facility to the northeast end of the permit area. The conveyor would tie into the overland conveyor system within the Sandow Mine, which would be extended to the end of the Sandow permit area as part of Sandow operations. Major components would include drive and tail pulley assemblies, loaded and empty idlers, a conveyor structure, fire suppression equipment, control systems, a cover structure, and elevated crossings to accommodate mine traffic.

The conveyor would be constructed using a continuous conveyor design that accommodates horizontal curves, eliminating intermediate transfer points. The conveyor would be covered on the top and one side by steel sheeting to reduce dust emissions. Belt cleaners and a spray wash bar at the head pulley would clean the conveyor belt after the coal is discharged. Following cleaning, the belt would be turned over for the return to the tail (loading) end of the conveyor to prevent spillage of lignite residue from the return belt. Another turnover mechanism at the tail end would restore the belt to its lignite transport configuration.

Typical Ephemeral Drainage Crossing



Middle Yegua Creek Crossing

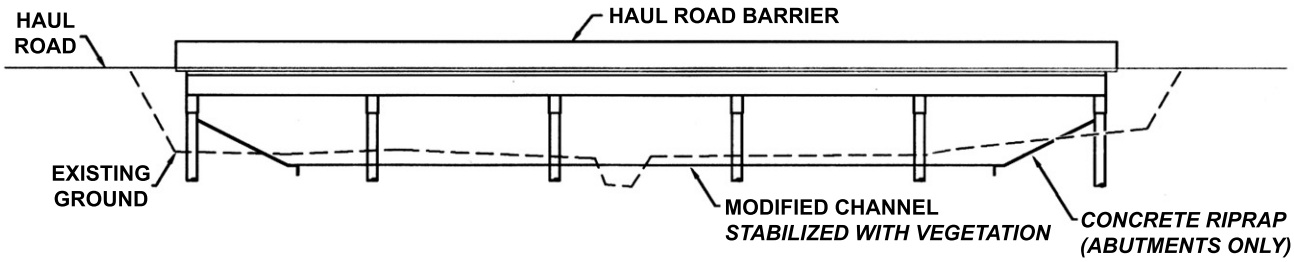


Figure revision: Revised labels relative to redesign of Middle Yegua Creek crossing.

Three Oaks Mine

Figure 2-10

Diagrams of Typical Ephemeral Drainage and Middle Yegua Creek Haul Road Crossings

Source: Hodges 2003.

4/16/03

Table 2-10
Fuel and Lubricant Tank Storage

Fuel/Lubricant	Number of Tanks	Tank Size (gallons)
Diesel	4	25,000
10 weight oil	1	1,000
50 weight oil	1	1,000
90 weight oil	1	1,000
Gasoline	1	12,000
10 weight hydraulic oil	1	6,000
15W40 engine oil	1	6,000
50 weight gear oil	1	6,000
Waste oil	1	15,000
Antifreeze	1	2,000
Waste antifreeze	1	2,000

Source: Hodges 2001.

Refuse and Solid Waste Disposal

During construction and operation, all non-hazardous wastes would be disposed of in accordance with all applicable state and federal regulations, as well as any waste disposal permits or registrations issued for the site. Non-hazardous wastes could include paper, wood, bricks, stones, concrete, fencing materials, and other waste materials. Combustible wastes such as scrap lumber, trees, and brush debris normally would be burned onsite in accordance with TNRCC regulations (30 TAC Chapter 111, Subpart B), if approved by the county sheriff. Material that is allowed by TNRCC to be re-used for beneficial use or recycled would be recycled. ~~This may include placing the material~~ ***Materials not recycled may be disposed of*** in the pit. ~~to bring the land back to approximate original contour~~ Such wastes would be buried under a minimum of 4 feet of backfill material and would be compacted through the normal process of material handling. All other non-hazardous waste would be transported to either an existing Class 2 facility permitted by TNRCC at the Sandow Mine or to a commercial landfill.

Fencing and Site Security

During the construction phase, perimeter fencing, gates, earthen berms, and appropriate signage would be installed to restrict public access to the proposed permit area. These would be maintained throughout the life of the project to restrict public access. Alcoa would have employee or contract security personnel continuously onsite throughout construction and operation.

Outside Storage

Alcoa support facilities would include outside storage of large equipment parts, wire rope, electrical trailing cable, pallets of consumable parts, conveyor belting, idlers and drums, tires, buckets, and other large repair or spare equipment needed for normal operations. The storage areas would be located at the mine maintenance and contractor areas and would be graded to control storm water drainage, finished with a graveled surface, and fenced for security.

Parking

Employee, contractor, and visitor parking areas would be part of the support facilities area. Equipment parking also would be constructed adjacent to the proposed maintenance facilities. These sites would be graded to control storm water drainage and graveled or paved, as required.

Lighting

The facilities area, as well as the transportation and utility corridor, would be equipped with lighting for safety and security reasons. Mobile light plants would be used in the pit areas as required by Mine Safety and Health Administration (MSHA) to provide for night mining activity.

2.5.1.8 Lignite Handling System

Prior to initiation of mining, facilities for lignite handling would be constructed in the stockpile and blending facilities area of the Three Oaks Mine (see **Figure 2-3**). The system would be designed to accommodate delivery of the anticipated annual lignite production, as shown in **Table 2-6**, with a maximum throughput capacity of approximately 2,000 tons per hour (tph); average throughput capacity would be approximately 1,500 tph. The lignite handling system would include the following:

- Two 350-ton capacity truck dumps;
- Two crusher stations with a throughput capacity of 2,000 tph;
- Two transfer conveyors with a capacity of 2,000 tph;
- Dust control equipment;
- Four stockpiles with a capacity of 50,000 tons each;
- Live storage of 30,000 tons;
- Two sampling systems;
- Two ***ash analyzers and one elemental quality analyzer;*** ~~on-line analysis systems;~~
- Truck dump (existing Sandow Mine facility) located near the existing power plant facility; and
- 48-inch overland conveyor with a capacity of 1,500 tph.

2.5.1.9 Initial Mining Area

In preparation for mining, overburden would be removed from the initial mining area by draglines or mobile equipment and placed immediately northwest and adjacent to the excavated area to expose the upper lignite seam. The initial mining area would be located along the outcrop of the lignite seams in the northeast portion of the proposed mine area, as shown in **Figure 2-4**. Alcoa proposes to develop three panel areas (A, B, and C) in a phased manner. Area A, located north of FM 696, would be approximately 10,000 feet long. Lignite mining in Area A would be completed in the initial years to create an area for construction of permanent mine facilities. Area B, which would be developed during the same time frame as Area A, also would be approximately 10,000 feet long; it would extend the pit development southwest from Area A. Sequencing between Areas A and B would be necessary depending on the relocation of highway FM 619. Area C would be the last initial pit area developed. This pit would extend from the Area B pit approximately

4,000 feet to the southwest. Development of this pit would be the last of the sequence and would depend on development of Areas A and B as well as the schedule for relocation of county roads and utilities in these two mining areas. The proposed sequence is shown in **Figure 2-4**.

Selective handling of overburden is proposed for all areas. Specific engineering designs would be followed to ensure that the graded spoil from the initial pits would be sequenced so the upper 4 feet would meet the criteria for plant growth medium. All subsequent pits in each area would be approximately parallel to and downdip of the initial pit. Overburden and interburden from these pits would be graded to tie into the topography and drainage patterns established by the graded spoils from the initial pit.

Haul roads from the pit areas to the blending facilities would be constructed beginning with the initial pit. The haul roads would be located in the overburden spoil areas associated with initial pit excavation. These roads would be constructed in compliance with all MSHA regulations. Haul road grades would range from 0 to 2.5 percent with ramp sections ranging from 8 to 10 percent. Permanent sections of haul road would be surfaced with crushed stone. BMPs would be used to control fugitive dust emissions from haul road surfaces. Dust control measures may include, but would not be limited to, the use of water trucks to periodically spray the road surfaces with water and/or a chemical dust suppressant such as magnesium chloride, and periodic road maintenance to maintain compaction of the road surface. In addition, vehicle travel on roadways of primary usage would be limited based on road conditions, with traffic rerouted during extremely dusty conditions. Vehicle travel on primary roadways also would be controlled by posted speed limits.

Alcoa ~~plans to~~ ***may*** use bottom ash material generated ***by TXU Unit 4*** at the Rockdale power generating station as road surfacing material at the proposed Three Oaks Mine. The material would provide an all-weather surface for vehicular traffic. Bottom ash would be hauled by dump truck to the desired locations at the Three Oaks Mine. Distribution on road surfaces would be accomplished by scrapers or end-dump trucks. Graders would be used to level the material to a maximum depth of 6 inches. ***Alcoa estimates that approximately 18,225 tons of bottom ash would be used annually for road surfacing material at the Three Oaks Mine. Approximately 57 percent of the bottom ash produced at the Rockdale generating station is recycled for commercial use. Recycled bottom ash currently is used as a road surface material and as an aggregate and raw material for production of abrasives (Hodges 2002d).*** Bottom ash on temporary roads would be removed from the roadway during reclamation and placed as backfill in pit and ramp areas at a depth of 4 feet or more below the surface or disposed of at a Class 3 waste disposal site.

Prior to use of bottom ash at the proposed mine site, Alcoa would obtain TNRCC and RRC approval, as appropriate. Bottom ash is currently approved by the TNRCC for use as road surfacing on haul roads, and it is approved by the RRC for use as backfill at Alcoa's existing Sandow Mine. In advance of approval for use at that facility, it was determined by TNRCC that the bottom ash from the generating facility met the criteria for classification as a Class 3 industrial waste as defined in 30 TAC 335.507 (Alcoa 2000 [Volume 8]).

Utilities

As shown in **Table 2-8**, portions of the existing LCRA 138-kV power line, Bluebonnet 14.4-kV power line, and Texas Utilities Fuel Company (TUFCO) gas pipeline would be relocated. The Seminole gas pipelines would be crossed by the haul road using RRC pipeline crossing standards. GTE telephone and fiber optic cable lines and Aqua waterlines (currently along FM 696 and CR 102) would be relocated within the rights-of-way (ROWs) of the FM 696 and CR 102 relocations, with trunk tie-ins to local services. Bluebonnet power lines and Verizon phone lines would undergo minor relocations in the vicinity of the haul road where it intersects CR 306 and CR 312. These relocations would be completed in coordination with the controlling company prior to interruption of the existing infrastructure by initial mining activities. See Section 2.5.1.5 for a description of proposed new utilities.

Public Roads

Both county and state roads would be relocated prior to initiation of construction at the proposed Three Oaks Mine (**Figure 2-5**). Preparation for mine development and construction of support facilities would require the upgrade, extension, relocation, or closure, as applicable, of certain segments of farm-to-market and county roads that occur in the proposed mine area (see **Table 2-7**). In addition, construction of grade separation crossings would be required for FM 619, FM 696, CR 304, CR 306, and CR 312. Grade separation crossings would involve an overpass over the public road for the transportation and utility corridor to address safety concerns associated with these intersections. Alcoa would coordinate all design, construction, and operations activities associated with the entity responsible for each road.

2.5.2 Operations Phase

The operations phase of the proposed project would include activities associated with the normal, steady-state mining operations through full production and up to commencement of planned closure and reclamation. The following sections describe the routine mining activities associated with this phase as well as associated infrastructure modifications, maintenance activities, and concurrent reclamation activities required at the mine.

2.5.2.1 Surface Water Control Facilities

Under TPDES regulations, Alcoa is required to manage storm water and wastewater releases. Part of this program involves implementing Best Management Practices (BMPs). Before and during operations, Alcoa would use BMPs to limit erosion and reduce sediment transport as a result of storm water runoff from proposed project facilities and disturbance areas. These BMPs may include, but would not be limited to, installation of erosion control devices such as sediment traps, silt fences, straw bales, and rock or gravel cover. In addition to the diversion ditches and sediment ponds installed during the construction phase, a series of additional diversions and sediment control ponds would be constructed incrementally over the life of the mine to divert and route storm water and control sediment in surface water runoff, respectively, from lands newly disturbed during advancement of the mine pits (see **Figure 2-9**). The design, construction, and operation of these facilities would be as described in Section 2.5.1.1, Surface Water Control Facilities (Construction Phase). Structures that would be constructed during various periods of the mine operation (beyond those already listed in Section 2.5.1.1) include the following:

- Sediment ponds
  SP-3 – prior to mining Contingency Areas 1 and 3
  SP-6 – year 7
  RPC-1 – year 5

- Diversion ditches
  DD-3 (Phase 2) – in second permit term, years 6 to 10
  DD-4 – prior to mining Contingency Areas 1 and 3
  DD-6 – prior to mining Contingency Areas 1 and 3
  DD-7 – year 5
  CD-2 – year 12
  CD-3/DD-8 – year 7
  CD-4 – in second permit term, years 6 to 10

In actual practice, it may become necessary for some of these structures to be constructed earlier or later than anticipated above. ***As described in Section 2.5.1.1 of the Final EIS, these surface water control facilities have been designed by a registered professional engineer in accordance with applicable regulations.***

Peak flows and storm event runoff volumes were projected using standard procedures, local area data, and inputs as recommended in Texas engineering literature and RRC regulations. Sediment volumes were derived by Revised Universal Soil Loss Equation (RUSLE) inputs for sheet and rill erosion, with additional gully erosion estimates. RUSLE erosion rates were estimated using a conservative soil erodibility factor, and were calculated in a manner that reflects the advance of mining and reclamation. The sediment ponds were designed to accommodate a regional sediment delivery ratio (0.43, as developed by NRCS studies) and a 3-year volume of sediment accumulation, in accordance with minimum volumes required by RRC. ~~No~~ ***The resulting*** sediment volumes were incorporated into the detention pond designs~~;~~. ***The sediment level would be surveyed annually and maintenance of the sediment pool provided, if necessary.*** ~~however, outflows from these structures would not reflect mined-area runoff, and they also would be periodically inspected and maintained.~~ In general, an average of approximately 640 acres of the mined area would be unvegetated at any one time as mining proceeds. Sediment derived from such areas would be collected in the appropriate ponds. In turn, these would be cleaned out and the resulting materials disposed of in the active backfill area. When these areas are reclaimed successfully, the overall sediment yield would be equal to or less than the undisturbed condition, and the ponds would be removed and reclaimed.

Proposed diversions would include ditches to convey water from undisturbed areas around the mine area and ditches to convey runoff from disturbance areas to the sediment ponds. Diversions were designed on the basis of a 10-year, 24-hour event flow (in excess of the 10-year, 6-hour flow required by RRC regulations). Sideslopes would be 4 horizonal:1 vertical. Riprap or concrete reinforcement would be installed, as needed, or, alternately, the ditches would be grass-lined to minimize lateral erosion and bottom scouring. Drop structures also would be incorporated, as necessary. Flow capacities of the proposed diversions would be equal to or greater than the capacities of the natural channels that would be replaced.

2.5.2.5 Haul and Access Road Construction

Graveled haul roads would be extended in the proximity of the pit as the pit area progresses to facilitate continued mining. Additionally, access roads also would be constructed incrementally to provide access for clearing, soil salvage operations in prime farmland areas, construction, and maintenance of surface water control facilities and groundwater pump sites. The access roads and haul roads would be designed, installed, and maintained as discussed in Section 2.5.1.7, Ancillary Support Facilities (Construction Phase), and Section 2.5.1.9, Initial Mining Area (Construction Phase), respectively.

2.5.2.6 Overburden and Interburden Removal

The active mine pits would be between 2,000 and 10,000 feet in length, approximately 140 feet in width, and up to 250 feet in depth, with a typical highwall angle of approximately 50 to 75 degrees. Benches of varying heights would be established to coincide with the overburden and interburden above each lignite seam.

Following the excavation of the initial box cut, the draglines would operate from one end of the pit area to the other, placing the spoil in a previously mined-out pit as part of the land reclamation. Both highwall side and spoil side locations would be used by draglines to remove overburden and interburden material. Mobile equipment such as dozers, scrapers, backhoes, end-dump trucks, and front-end loaders also may be used for overburden and interburden removal. This equipment would be used to clean exposed lignite seams. The overburden or interburden would be placed in the end-dump trucks for transport to a previously mined-out pit. Sequential overburden and interburden removal and pit backfilling would continue throughout the life of the mine.

Alcoa's selective handling plans for overburden and interburden have been developed to ensure segregation of suitable growth medium from potentially acid forming or toxic materials naturally occurring within these geologic materials. Continuous core samples have been collected and analyzed to identify the lenses of suitable growth medium within the overburden profile. The potentially acid forming or toxic overburden and interburden materials would be placed low in the pit backfill profile, and the favorable materials would be placed in the upper part of the profile to ensure that the top 4 feet would provide a suitable growth medium. Based on the results of the core sample analyses and experience at the Sandow Mine, adequate quantities of suitable materials would be available for use as a growth medium. ***Through Alcoa's mine permit application process and interaction between Alcoa and the RRC, the selective handling performance criteria shown in Table 2-10a were adopted for the Three Oaks Mine.***

The selective handling program would be similar to the program employed at the Sandow Mine since 1985. Laboratory analyses from representative geologic core samples are used to indicate zones of acceptable overburden and interburden materials, based on suitability criteria approved by the RRC. Range diagrams are then developed to identify the locations and depths of suitable versus unsuitable materials. An extensive training program and meetings are conducted with dragline operators and mining supervisors as mining progresses. These steps ensure that suitable materials are placed near the surface of the spoil piles, and that unsuitable materials are placed lower in the pit. Quality control is conducted to sample and test the recontoured materials prior to final grading and revegetation. If unsuitable materials are found on the surface to be reclaimed, they are handled

in accordance with applicable regulations prior to the completion of reclamation. The same program would be implemented at the Three Oaks Mine.

Lignite that does not meet power plant specifications or where the seam is too thin to be recovered cleanly would be placed in the pit as spoil. Lignite that is to be treated as spoil would be selectively handled to ensure it is placed low in the spoil profile. The lignite would be placed such that after the spoil leveling there would be a negligible amount of lignite in the upper 4 feet of the reclaimed surface. From the time a spoil peak is created to the time it is leveled, essentially all lignite would be buried at a depth that would be much greater than 4 feet and thus would not come in contact with storm water after leveling.

Table 2-10a
Post-mine Soil Performance Standards
Areally-weighted Frequency Distributions

Parameter[1]	Depth (inches)	Standard	Maximum Percent of Area
pH (standard units)	0 – 12	4.5 – 4.9	7
	12 – 48	4.0 – 4.4	1
		4.5 – 4.9	16
Acid-base accounting (ABA) (tons/kiloton)	0 – 12	-2	1
		-1	7
	12 – 48	-6	1
		-5	1
		-4	10
		-3	8
		-2	8
		-1	21
Sand (percent of fraction)	0 – 12	81 – 85	11
		86 – 90	10
		91 – 95	1
Clay (percent of fraction)	0 – 12	41 – 45	1
		46 – 50	1
		51 – 55	1
Electrical conductivity (mmhos/cm)	0 – 12	≤ 4	100
	12 – 48	≤ 4	100
Sodium absorption ratio (SAR)	0 – 12	≤ 13	100
	12 – 48	≤ 13	100
Boron (ppm)	0 – 12	≤ 5	100
	12 – 48	≤ 5	100
Cadmium (ppm)	0 – 12	≤ 0.7	100
	12 – 48	≤ 0.7	100
Molybdenum (ppm)	0 – 12	≤ 5	100
	12 – 48	≤ 5	100
Selenium (ppm)	0 – 12	≤ 2	100
	12 – 48	≤ 2	100

[1]mmhos/cm = millimhos per centimeter.
ppm = parts per million.

Source: RRC 2002.

stockpile/blending facility that would be located north of the mine pit area but within the mine permit boundary (see **Figure 2-3**).

2.5.2.8 Lignite Handling System

The lignite stockpile/blending facility is described in Section 2.5.1.8, Lignite Handling System (Construction Phase). The Area B truck dump/crusher and a connecting transfer conveyor to the blending facility would be constructed during approximately year 4 of the operation (see **Figure 2-3**). This facility would include a hopper, crusher, and a stockpile. The Area B truck dump crusher would not be constructed until the lignite is completely removed from beneath the proposed location. Once constructed, the Area B crusher would become the primary crusher for the mine.

In order to provide the quality of lignite necessary for operation of the existing power generating facility, higher ash seams (lower quality lignite) would be blended with lower ash seams (higher quality lignite) to optimize quality (determined by percent ash, sulfur content, and energy potential or British Thermal Unit [BTU] level). Without blending, the higher ash lignite may not be useable and would become part of the mine spoil, resulting in a lower volume of recoverable lignite from the site. Lignite blending at the Three Oaks Mine would be conducted as follows:

- Lignite would be discharged from off-highway trucks into a truck dump hopper at the crusher.
- Lignite would be crushed to a nominal 6-inch size or less.
- Sampling would be conducted for quality analysis (including on-line quality analysis).
- Crushed lignite would be conveyed to one or more of the stockpiles.
- Feeders and conveyors would be used to reclaim and transport the lignite from one or more of the blended stockpiles for blending purposes.

Lignite stockpiles would be managed as facility components under TPDES permit requirements. All lignite stockpiles would incorporate appropriate erosion control measures such as diversion channels and/or berms around the stockpiles to prevent storm water run-on from surrounding areas and erosion from overland runoff from the stockpiles. BMPs, such as silt fences or staked straw bales, also may be used to control sediment transport. All perimeter disturbances would be stabilized, revegetated in accordance with the specifications in the project's Reclamation Plan, and maintained through BMPs. All lignite stockpiles would be removed either as part of the mining process or during final reclamation.

To control fugitive dust emissions from the lignite stockpile/blending facility, stockpiles periodically would be inspected for problems. Lignite may occasionally smolder or burn in the stockpiles; spontaneous combustion can occur based on moisture, humidity, and temperature conditions. Combustion is typically limited to a small area within the stockpile, usually comprising a few cubic feet of material. When smoldering material is identified from wisps of smoke, a bulldozer promptly separates the burning material, which is then extinguished by burial or water application. Water and chemical sprays would be used at lignite loading and

of the active pit spoil peak would have been in place for 5 months, the adjacent spoil peak would have been in place for 10 months, and the third peak (rough leveling area) would have been in place for 15 months. Therefore, peaks would be rough leveled within approximately 15 months of their creation.

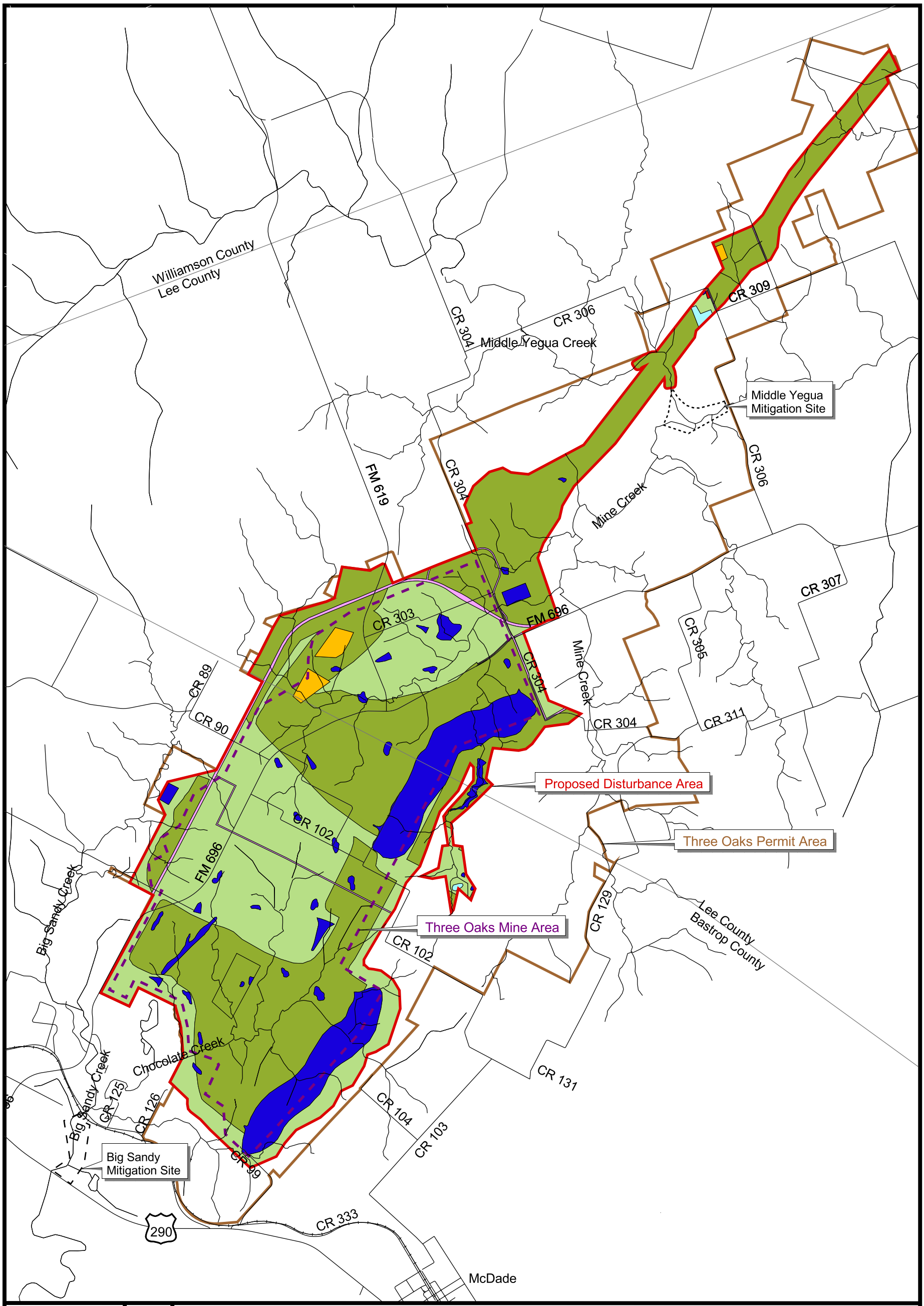
Reclamation for the proposed Three Oaks Mine would include both short-term and long-term goals for the project area. The short-term goals would include soil stabilization, maintenance of vegetative cover, providing for public safety, and promoting wildlife and livestock protection within and adjacent to the active reclamation operations. The primary objective of revegetation would be the rapid establishment of ground cover for erosion control purposes. The long-term goal of reclamation would be the establishment of a sustainable vegetative cover that would promote the desired post-mining land uses and restore the productivity of the mined land to a condition equal to or exceeding the pre-mine land uses.

Post-reclamation land uses identified for the proposed Three Oaks Mine include fish and wildlife habitat, cropland, undeveloped land, pasture land, developed water sources, industrial/commercial uses, and residential uses (single dwelling). Land use management plans would be developed by Alcoa in coordination with the jurisdictional agencies (RRC and USACE) for use as land management tools on land placed in an extended responsibility period (ERP), except for undeveloped land. The plans would be developed based on an inventory of forage resources, physical features, pre-mine yield estimates, and management objectives. Cross fences may be constructed as necessary to meet post-mining management goals and contractual agreements.

Section 12.147 of the RRC regulations requires the identification of post-mining land uses for lands that would be disturbed by the mine during the initial RRC permit term. Reclamation of the 8,648 acres of total disturbance within the RRC permit area (see Table 2-5) is proposed (Hodges ~~2002~~***2003***) to include ~~4,520~~ ***4,550*** acres of **managed** wildlife habitat, ~~3,031~~ ***2,996*** acres of pastureland, 70 acres of cropland, 895 acres of developed water resources (i.e., end lakes and small ponds to provide fish and wildlife habitat), 123 acres of industrial/commercial uses (roadways), 1 acre of residential use, and 14 acres of undeveloped land**,** ***considered here to be unmanaged wildlife habitat,*** (land that will be reclaimed and on which subsequent management by the individual land owner has not been determined) (see Figure 2-12). Approximately 379 acres of riparian corridor would be created by planting bottomland trees along some of the restored channels and pond edges counted within the above categories. Alcoa has committed to mitigate disturbed ephemeral and intermittent watercourses at a ratio of 1:1 to 2:1 (average replacement ratio of 1.4:1, depending on habitat quality of existing stream channel); on-channel ponds at a minimum ratio of 1.5:1; and non-forested wetlands at a ratio of at least 2:1. Post-mining land uses were developed to enhance the future land use while maintaining land stability, vegetative cover, drainage, and water quality and quantity. ***A portion of the required mitigation for waters of the U.S. would occur in offsite mitigation areas (see Appendix E of the Final EIS).***

RRC regulations require that Alcoa post a reclamation bond equal to the estimated costs of reclamation at permit term intervals throughout the life of the mine and for the final closure site conditions. Bond monies would assure that reclamation would be completed regardless of Alcoa's financial ability to do so.

The reclamation steps planned for and required by RRC regulations are described in the following sections.



Post-mine Land Uses (Conceptual)

Figure 2-12

Three Oaks Mine

Legend

- Cropland
- Developed Water Resources
- Fish & Wildlife Habitat
- Industrial/Commercial
- Pastureland
- Undeveloped
- Residential

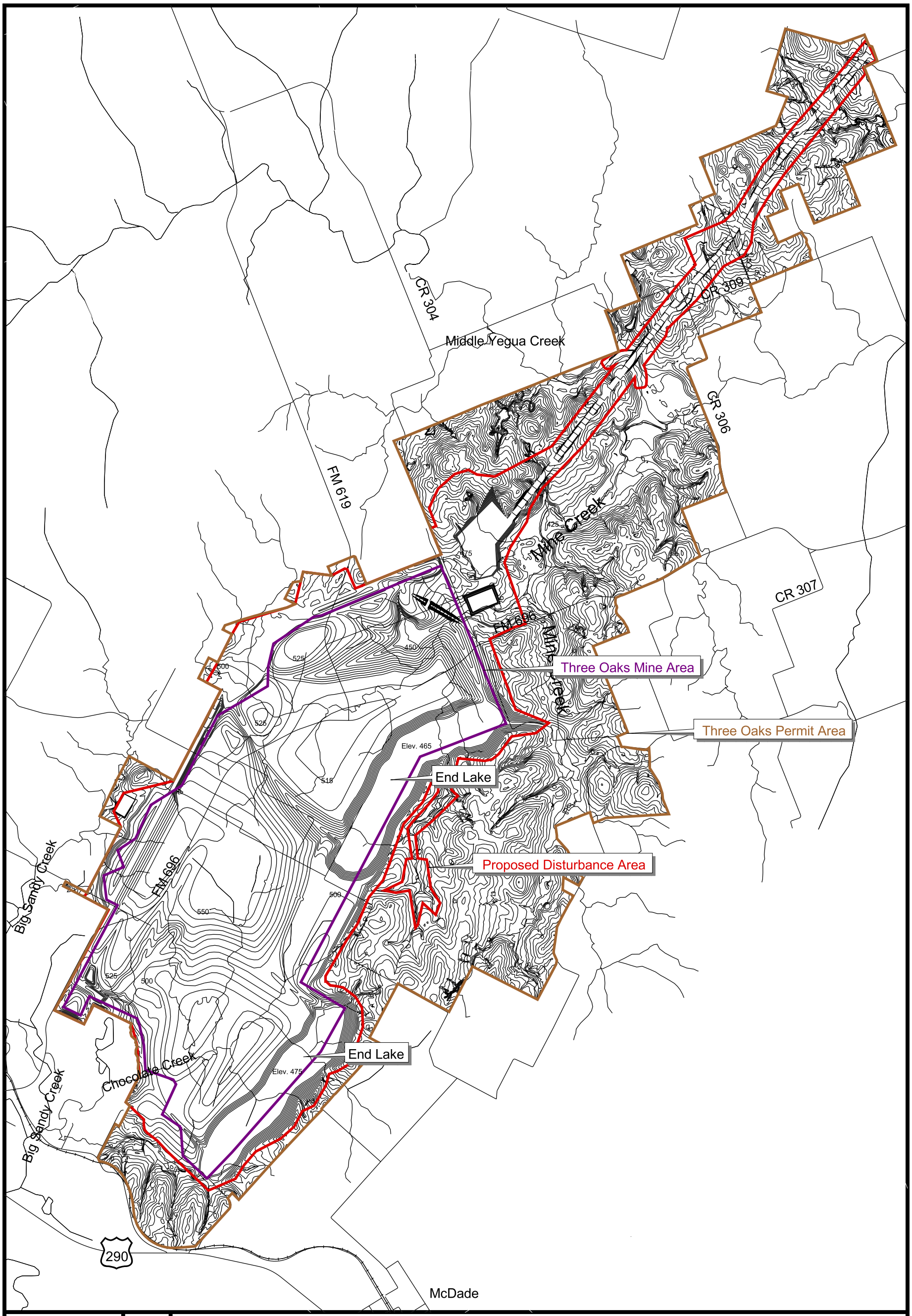
Source: Alcoa 2000 (Volume 6).

Figure revision: Revised disturbance area for transportation and utility corridor crossing of Middle Yegua Creek; added Big Sandy Mitigation Site.

N

0 2000 4000 Feet

3/7/03



Three Oaks Mine

Post-mining Topography (Conceptual)

Figure 2-14

Contour Interval: Five Feet

Figure revision: Revised disturbance area for transportation and utility corridor crossing of Middle Yegua Creek.

N

0 2000 4000 Feet

Source: Adapted from Alcoa 2001c.

1/28/03

Pesticide Applications

Alcoa would contract with a licensed applicator to apply herbicides and insecticides as needed to ensure successful reclamation. The specific pesticides used and applications rates would be determined by the nature of problems encountered, season of use, location, and other factors. All pesticides would be applied in accordance with manufacturers' and agency instructions. The licensed applicator would prepare the spray mixtures, apply the materials, and dispose of any waste materials in an appropriate manner at an offsite facility. Bulk pesticides would not be stored at the mine site. It is expected that the following may be used at the Three Oaks Mine.

Herbicides:

- Oasis – control of Johnson grass
- Riverside Brash – weed control
- Garlon 4 – brush control in tree plots
- Oust – weed control in tree plots
- Grazon P&D – weed control

Insecticides

- Methyl parathion 4 EC – army worms

2.5.3.6 Restoration of Waters of the U.S. Including Wetlands

Alcoa has committed to long-term protection and mitigation measures related to waters of the U.S. including wetlands (Alcoa 2001c [Volume 4]; 2002a,d). These measures include reclamation of wetlands, riparian woodland along ephemeral and intermittent stream channels, and surface water features. The proposed mitigation measures include both onsite replacement of features removed within the area disturbed by mining plus creation or enhancement of additional features in ~~an~~ ***two*** offsite protected area***s*** (**Figure 2-12**). ***The first of these would be created*** along Mine Creek and Middle Yegua Creek ***and is*** termed the Middle Yegua Mitigation Site. ***The second site is located a short distance west of the southern tip of the Three Oaks Mine permit area between U.S. Highway 290 and the Southern Pacific railway ROW; this site is termed the Big Sandy Mitigation Site.*** The goal of the***se*** offsite mitigation ***areas*** is to restore and enhance ~~an~~ intermittent stream floodplain***s*** to the highest quality riparian habitat within the Three Oaks Permit Area and to protect it in perpetuity. For purposes of this analysis, the USACE has assumed that through successful implementation of the proposed Mitigation Plan (Alcoa 200**3**~~2d~~), the full area of mitigation and enhancement subsequently would meet the USACE's criteria of waters of the U.S. and constitute acceptable mitigation for the anticipated disturbances.

Ephemeral and intermittent stream channels exhibiting "ordinary high water marks" (thus, meeting the primary criteria as waters of the U.S.) within the proposed disturbance area have been evaluated and characterized as low, medium, or high quality. Low-quality streams are defined as ephemeral streams that traverse open pastureland and have minimal hydrophytic vegetation or are highly eroded. Medium-quality streams are defined as ephemeral or intermittent streams that have a narrow, relatively undisturbed vegetated corridor (woodland, native herbaceous, or hydrophytic) and that are somewhat stable. Ephemeral or intermittent streams that have a broad, mature riparian corridor vegetated by desirable woodlands are characterized as high quality.

Low-quality ephemeral streams would be mitigated at a minimum ~~replacement~~ ratio of 1:1 (based on the area of affected stream channel). Medium-quality streams would be mitigated at a minimum ratio of 1.5:1 while high-quality streams would be ~~replaced~~ ***mitigated*** at a minimum ratio of 2:1. ~~Channel lengths would be restored at a ratio of 1:1.~~ Herbaceous wetlands would be mitigated at a minimum ratio of 2:1, on an area basis. On-channel ponds (qualifying as waters of the U.S.) would be reclaimed at a minimum ratio of 1.5:1, again on an area basis. **Table 2-14** presents a summary of the affected waters of the U.S. ***and*** the planned mitigation ratios***.*** ~~and areas, and the distribution of mitigation areas between the onsite mine reclamation area and the offsite Middle Yegua Mitigation Site.~~ See Section 3.2.5 ***and Alcoa's Mitigation Plan in Appendix E of the Final EIS*** for more details regarding restoration of waters of the U.S.

2.5.3.7 Final Pit Reclamation

The land use that is proposed for the two final pits at the Three Oaks Mine is open water. It is anticipated that the final mine pits would be reclaimed as open water. The water level in the pits would be consistent with the potentiometric surface of the adjacent undisturbed Calvert Bluff Formation. This would result in two end lakes totaling approximately 722 acres in size and up to 100 feet deep. Margins of the end lake areas would be graded at a ~~3~~***6*** horizontal:1 vertical slope to a level approximately 10 feet below the average waterlines to ensure safe access and use of the site as well as to meet requirements for reclamation. In addition, spillways would be constructed to provide for discharge to local drainages during larger storm events. The final end lakes would be designed and approved by the RRC and TNRCC prior to final closure activities. Other attributes that may be associated with the end lakes would include upland islands ***along the shallow margin***, a varied shoreline to encourage a wetland fringe with diversity of plant species, connections to existing riparian systems, and springtime nesting cover. In addition, bottomland tree species would be planted along portions of the pond perimeters to create additional riparian areas.

2.5.3.8 Reclamation of Ancillary Facilities and Disposition of Equipment

Closure of ancillary facilities and disposition of equipment would be conducted in compliance with applicable federal, state, and local regulations. All ancillary structures (e.g., buildings, conveyors, power lines) would be dismantled and removed from the site. Concrete foundations and pads would be broken up and covered with at least 4 feet of fill material. These sites would be recontoured to blend with the surrounding topography to the extent practical. Stockpiled prime farmland topsoil would be redistributed in appropriate areas prior to seeding. Revegetation would be completed as described in Section 2.5.3.5 in accordance with the post-mining land use. All equipment would be transported off the site.

Roads

Haulage and access roads not required for long-term monitoring and management purposes would be recontoured to blend with the surrounding topography and the natural drainage patterns. Prior to recontouring of roadways, bottom ash, where used as a road surfacing material, would be removed from the roadway and placed as backfill in the pit areas or hauled to a licensed disposal area for Class III wastes. These areas would be reclaimed in accordance with the post-mining land use.

Table 2-14
Mitigation Summary for Disturbance to Waters of the U.S.

Waters of the U.S.	Disturbance Area		Mitigation Ratio	Required Mitigation	
	Linear Feet	Acres		Linear Feet	Acres
Stream low-quality	51,511	6.7	1:1	51,511	6.7
Stream medium-quality	123,537	13.3	1.5:1	185,306	20.0
Stream high-quality	23,370	3.6	2:1	46,740	7.2
Stream Subtotal	198,418	23.6	N/A	283,557	33.9
Wetlands	N/A	5.3	2:1	N/A	10.6
Ponds	N/A	38.5	1.5:1	N/A	57.8
Total	198,418	67.4	N/A	283,557	102.3

Source: Horizon 2003.

Residential Land

Evaluation of residential land use would be based on ground cover and tree stocking density where applicable. Ground cover within this land use would be sufficient to control erosion. If trees should be planted, Alcoa would develop site-specific standards for success in conjunction with the TPWD. Approximately 1 acre of the disturbance area would be developed as residential.

Developed Water Resources

Alcoa in coordination with the USACE would identify and inventory appropriate waters of the U.S. including wetlands reference sites for use in evaluating reclamation success for developed water resources at the Three Oaks Mine. The reference sites would be specific to the project's Section 404 permit requirements. Developed water resources would cover approximately 10.4 percent of the reclaimed total disturbance area.

2.5.4 Summary of Committed Environmental Protection Measures

Table 2-15 summarizes Alcoa's proposed environmental protection measures to reduce environmental impacts of the proposed Three Oaks Mine***; these measures are reflected in the impact analysis of the Proposed Action in the EIS***. In addition, **Table 2-15** identifies ~~potential~~ mitigation measures ~~currently being considered~~ ***to be required*** by the USACE based on the environmental impacts identified in this EIS. ***Alcoa has committed to implementing these mitigation measures during construction, operation, and reclamation of the proposed Three Oaks Mine.***

2.6 Past, Present, and Reasonably Foreseeable Future Actions

The evaluation of cumulative impacts associated with the proposed Three Oaks Mine is dependent on identification of those past, present, and future actions in the vicinity that cause impacts affecting the same resources and overlap in a geographic and temporal manner with the anticipated impacts from the Proposed Action. The geographic areas considered for these potentially interrelated actions vary among resources (see Chapter 3.0), since a remote activity may contribute to cumulative impacts for one resource (e.g., air quality) while not contributing to cumulative impacts for other resources that are affected primarily by site-specific activities (e.g., soils). The list below includes potentially interrelated actions likely to contribute to cumulative impacts to one or more of the resources under consideration in this EIS.

2.6.1 Past and Present Actions

The land uses surrounding the proposed Three Oaks Mine have been relatively stable over recent decades. There have been a limited number of major capital projects and reasonably steady population growth of local communities with increasing numbers of residents commuting to jobs in the Austin metropolitan area. The past and present actions anticipated to contribute to cumulative impacts to those resources affected by the proposed Three Oaks Mine are listed below (see **Figure 2-15**).

Table 2-15
Committed Environmental Protection Measures and Additional Mitigation Measures Under Consideration

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Geology and Mineral Resources	• As required by RRC regulations, mine spoils would be regraded to approximate original contour prior to being revegetated.	• No additional monitoring or mitigation is being considered.
Groundwater	• In accordance with the groundwater monitoring plan required by RRC regulations, Alcoa would monitor groundwater quantity and quality in the overburden (Calvert Bluff Formation), underburden (Simsboro Formation), and spoil material at regular intervals within the permit area and the mine area. At locations more distant from the mine area or outside of the permit area, water levels would be measured in both Alcoa owned wells and privately owned wells within the area where 5 feet or more of mine-related drawdown is projected during the current 5-year RRC permit term. • Spoil well data would be evaluated to determine if acid drainage is developing, with consequent potential for pollution by toxic metals. Should the data indicate water quality problems, RRC's direction would be based on case-specific conditions and could require analysis, treatment, or cessation of operations. • Alcoa would mitigate mine-related groundwater drawdown impacts to wells as required by RRC regulations. This mitigation could require lowering of pumps, new pump installation, well deepening, or provision of an alternate water supply.	• ***GW-1: Baseline Monitoring. Due to the proposed time frame (less than 1 year following receipt of permits) for initiation of mine-related pumping in the Simsboro aquifer, the USACE has further evaluated the effectiveness of mitigation measure GW-1 as presented in the Draft EIS. Based on this evaluation, the USACE has determined that existing groundwater level data for the Simsboro outcrop area west of the Three Oaks Mine, in addition to implementation of additional monitoring as described in revised mitigation measure GW-2, would provide an adequate baseline for assessing mine-related groundwater drawdown impacts. As a result, the USACE has eliminated mitigation measure GW-1 as presented in the Draft EIS.*** • ***GW-2: Monitoring of Depressurization Pumping and Operational Well Effects. Water-level changes in the Simsboro and Calvert Bluff Formations would be monitored on a quarterly basis, within and adjacent to the Three Oaks Mine permit area in the general area where 10 feet or more of drawdown is projected. The water levels would be used to compare measured declines to projected declines, and as a tool to verify the projected effects to off-site private and municipal wells in the Simsboro and Calvert Bluff Formations. Water-level monitoring would begin immediately following project approval by the appropriate agencies. At least five of the Simsboro monitoring wells would be in the outcrop area to the west of the Three Oaks Mine. Alcoa also would monitor surface water features, such as gaining reaches of streams, springs, seeps, and wetlands associated with the Simsboro outcrop.***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Groundwater (Continued)		*Alcoa would prepare a quarterly report summarizing and analyzing this monitoring information for the first 2 years from the start of pumping activities, and an annual report thereafter. The report would be submitted to RRC. The report would provide the water levels from wells in the monitoring program, the amount of depressurization pumping, the amount of operational pumping, and a projection of depressurization drawdown and operational drawdown resulting from Three Oaks depressurization pumping for the coming year. The report would provide documentation for use in assessing mine-related groundwater drawdown impacts as defined by the Three Oaks groundwater model, and the potential subsequent need for Alcoa to modify or replace existing private or municipal wells in accordance with RRC regulations.* *At the end of the first 5 years of operation, the Three Oaks life-of-mine (LOM) groundwater model would be validated against the observed drawdown in both the Calvert Bluff and Simsboro aquifers. The Three Oaks LOM groundwater model then would be recalibrated based on the 5-year drawdown data, and projections for the drawdown out to the 10-foot drawdown contour would be made for the remaining life of the mine. Following the first 5-year monitoring period, Alcoa would monitor groundwater in the Calvert Bluff and Simsboro aquifers semi-annually.* *The position of the projected drawdown contours for the Calvert Bluff and Simsboro aquifers would be used as a guide to determine the potential mine-related impacts of dewatering and depressurization operations on private and municipal wells in these two formations near the Three Oaks Mine. These projections would be updated every 5 years based on a 5-year recalibration of the Three Oaks LOM groundwater model to observed drawdown in these two aquifers.*

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Surface Water	• Surface water control facilities constructed prior to other components of the Three Oaks Mine would control runoff from disturbance areas as well as attenuate peak flows and extend periods of active stream flow following major rainfall events. • Discharges from sediment ponds would be monitored as required by TPDES permit conditions to control the quality and quantity of water released to local drainages. Treatment measures proposed by Alcoa include the addition of flocculants to control total suspended and total settleable solids, as well as baffles and vegetative filters, as appropriate. • Surface drainage characteristics would be restored to approximate pre-mining locations and configurations upon the completion of mining. No perennial streams would be disturbed. • During reclamation, terraces, small water-holding depressions, waterbars, and drop structures would be installed where necessary to minimize flow velocities and control erosion. • Alcoa would construct temporary waterways, wetlands, and aquatic habitats with the following measures to mitigate temporal impacts to waters of the U.S.: – Planting ~~cattail (*Typha latifolia*)~~ **American bulrush (*Scirpus americanus* var. *longispicatus*)**, ~~and~~ giant bulrush (*Scirpus californicus*), ***and smartweed* (*Polygonum* spp.)** around the perimeter of temporary sedimentation ponds to provide enhanced water-quality treatment and habitat value; – Placement of small check-dams or low-sill weirs in drainage channels to sedimentation ponds; the small retention area behind the weirs would be planted with wetland vegetation for additional water-quality treatment and habitat value; and	• ***SW-1: End Lake Shoreline Mitigation. End lakes would be constructed with a minimum of one lower floodplain terrace along the spoil-side shoreline that is designed at an elevation to be frequently flooded. When topography allows, the end lake shoreline would be designed to include a second terrace that is flooded seasonally. To mimic natural conditions and to prevent erosion, sideslopes would be gentle (greater than 7H:1V). Native tree, shrub, and herbaceous species would be planted throughout the planting bench and terraces, based on their inundation tolerance. Recommended species are provided in Table 6.2 of the Mitigation Plan (see Appendix E of the Final EIS).*** ***Alcoa would provide the USACE and TPWD a copy of detailed design plans for end lakes upon submittal to the RRC, and Alcoa would invite these agencies to comment on the designs with regard to grading and recontouring along the projected spoil-side shoreline margins. Alcoa's commitment to developing quality wildlife habitat and this consultation would ensure adequate inundation of large portions of the shoreline under conditions of fluctuating end lake water levels for the protection of surface water users.*** • ***SW-2: End Lake Outlets/Channel Mitigation. Outlet spillways for all structures would be designed to minimize the potential for erosion and downstream sedimentation. This is a requirement of the Surface Coal Mining Regulations, and the RRC reviews each structure for compliance with §12.345 of the regulations, Hydraulic Balance: Discharge Structures. Specifically,*** ***Drainage from sedimentation ponds, permanent and temporary impoundments, coal processing waste dams and embankments, and diversions shall be controlled by energy dissipaters, riprap channels, and other devices, where necessary, to***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Surface Water (Continued)	– Use of depressurization water for the creation of temporary wetlands. • Through creation of end lakes and discharge of mine water, there would be more surface water resources in the permit area during and after mining than currently exist. • Temporal impacts to waters of the U.S. would be mitigated through temporary wetland enhancements within the active mine area as well as mitigation up front in a dedicated 54-acre offsite area along Middle Yegua Creek and Mine Creek ***and a 51-acre offsite area along Big Sandy Creek***. Direct impacts would be mitigated through mine reclamation that recreates high quality streams and riparian zones along with ponds and wetlands that are similar or improved from the current condition. ~~The 54-acre Middle Yegua Mitigation Site~~ ***The offsite mitigation areas*** permanently would be protected by deed restriction. • Enhancements at the Middle Yegua Mitigation Site would include excavating small shallow depressions within the floodplain; planting herbaceous hydrophytic species within the depressions; adding low rock berms and snag piles; and planting trees and shrubs throughout the corridor to enhance species diversity. • All affected streams that qualify as waters of the U.S. would be replaced in the reclaimed mine area at a 1:1 ratio of their original length. Additional mitigation would occur based on stream quality and affected area. • Low-quality ephemeral streams (defined as streams that traverse open pastureland, which support little or no hydrophytic vegetation or are highly eroded) would be mitigated at a minimum ratio of 1:1 (based on the affected area of the stream). Medium-quality streams (defined as ephemeral or intermittent streams that have a narrow, relatively undisturbed vegetated corridor and that are somewhat stable) would be mitigated at a minimum ratio	***reduce erosion, to prevent deepening or enlargement of stream channels, and to minimize disturbance of the hydrologic balance. Discharge structures shall be designed according to standard engineering-design procedures.*** ***Cross-sectional surveys of the unnamed south tributary to Chocolate Creek would be conducted immediately prior to reclamation activities involving the South End Lake. Additional channel configuration monitoring downstream of the permit area would be conducted during the reclamation monitoring period prior to bond release. The South End Lake outlet would be configured to minimize flooding from the 2-year storm event and larger events in the areas downstream along the unnamed tributary. Channel stabilization along that tributary and Chocolate Creek would be undertaken, as needed, during the reclamation monitoring period to minimize the potential long-term effects of channel instability.*** ***Downstream cross-sectional surveys and channel geomorphological assessments would be conducted in the field immediately prior to reclamation activities involving construction of the end lake spillways and outfalls. A historical series of aerial photographs may be employed in addition to these investigations. The stream reaches involved would include Chocolate Creek and its unnamed north and south tributaries as utilized to convey discharges from a series of smaller ponds and the South End Lake, respectively; Big Sandy Creek from immediately upstream of its confluence with the aforementioned tributary and downstream to monitoring station LBS; and Mine Creek and the tributary of Mine Creek below the outfall of the proposed North End Lake. Alcoa would coordinate to obtain access permission from landowners for these activities. If it is determined through interactions with the USACE that the existing channel sizes and configurations are inappropriate for***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Surface Water (Continued)	of 1.5:1. Intermittent streams that have a broad, mature riparian corridor vegetated by desirable hardwoods would be considered high-quality streams and would be mitigated at a minimum of 2:1. Herbaceous wetlands would be mitigated at a minimum ratio of 2:1. On-channel ponds would be replaced at a minimum of 1:1. The proposed mitigation would result in mitigation areas of 6.7 acres for low-quality streams, 20.0 acres for medium-quality streams, 7.2 acres for high-quality streams, 57.7 acres for on-channel ponds, and 10.7 acres for herbaceous wetlands. • Of the total waters of the U.S. ~~replacement~~ ***mitigation*** acreages identified above, a minimum of 23.6 acres of streams and 5.3 acres of herbaceous wetlands would be restored in the mine reclamation area along with at least 57.7 acres of on-channel ponds. The remaining 10.3 acres of mitigation for streams and the remaining 5.4 acres of herbaceous wetlands required for mitigation would be accomplished in the Middle Yegua Mitigation Site ***and the Big Sandy Mitigation Site*** by creation and enhancement of wetland and riparian habitat along the existing channel***s***. ~~Mitigation accomplished through enhancement of an existing channel or other resource would occur at an additional 2:1 acreage ratio as compared to mitigation accomplished through creation of new channel or wetland areas, thus enhancement for high quality stream disturbances would be conducted at an overall 4:1 ratio as opposed to a 2:1 ratio for direct replacement.~~ • Water quality in local drainages would be protected through the construction of sediment and detention ponds, implementation of appropriate erosion and sediment control measures, and a water quality monitoring program meeting RRC and TNRCC requirements. • ***Sediment ponds would be constructed outside the existing drainage channels to maintain separation of runoff from construction areas and unaffected areas.***	***the post-construction conveyance requirements, Alcoa would be required to perform work to ensure long-term channel stability under the dominant channel-forming discharge. End lake and pond series outlets to receiving streams would be configured so as not to create significantly damaging increases in downstream predicted surface water elevations from a 2-year, 24-hour storm event. Predicted downstream water surface elevations for the 100-year, 24-hour storm event would not be increased more than 1.0 foot above modeled baseline conditions in the areas downstream. Overall efforts may include channel realignment or stabilization, preferably incorporating biostabilization methods, subject to landowner permission for access and disturbance. Additional channel configuration and erosion and sedimentation monitoring downstream of the permit area would be conducted during the reclamation monitoring period prior to bond release, and modifications to any stabilization efforts would be made, as necessary.*** • ***SW-3: Stream Crossing Mitigation. When designing and constructing bridges and culverts, Alcoa would adopt the following general conditions in addition to the design criteria and performance standards required by the Surface Coal Mining Regulations:*** ***a. Proper Maintenance. Bridges and culverts shall be properly maintained, including maintenance to ensure public safety.*** ***b. Erosion and Sediment Controls. Appropriate soil erosion and sediment controls will be used and maintained in effective operating condition during construction, and all exposed soil and other fills as well as any work below the ordinary high water mark must be permanently stabilized at the earliest practicable date. Construction will be planned during periods of low-flow or no-flow.***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Surface Water (Continued)	• ***Fresh water stream diversions would be constructed to divert upstream freshwater flows around disturbed mine areas for subsequent discharge downstream.*** • To increase sediment removal from the water column, cattails and giant bulrush would be planted around the perimeter of each pond within 60 days of the pond construction. Sedimentation ponds would be constructed with a shallow planting bench, 5 to 10 feet wide along the perimeter of the ponds wherever practicable. Planting benches would gently grade from the surrounding ground elevation to a depth not to exceed 2.5 feet. The planting bench would be constructed outside of the original design specifications for each pond and would, therefore, increase the capacity of each pond. • Excavation of shallow pools (1 to 1.5 feet deep) in the reconstructed or diverted stream channels would create small wetland depressions and improve sediment deposition. The elongated pools would be 20 to 40 feet long, but would not abut stream channel sideslopes to reduce the potential for erosion. The pools would be excavated at a minimum of every 500 feet along the constructed temporary stream channels and would be planted with hydrophytic vegetation. • As part of the permanent stream restoration, temporary stream channels designed primarily for flood flow and erosion control would be eliminated and replaced with more natural stream channels and wooded riparian corridors that form a dendritic pattern. The permanent stream channels would be significantly different from the temporary, trapezoidal channels. Within previously reclaimed areas, stream corridors would be cut into the broad, gentle swales that would be created post-mining. Restored streams would meander with a sinuosity that is appropriate for specific site conditions. Typical streams would have meander lengths 2 to 5 times the width of the meander. All restored streams would be constructed with one or more floodplain terraces to mimic natural	***c. Water Quality. Alcoa will provide water-quality management measures that will ensure that the authorized work does not result in more than minimal degradation of water quality. Such measures will include the implementation of BMPs such as disturbing the smallest practicable area for the project, using straw dikes, riprap, check dams, mulches, vegetative sediment filters, and other measures to reduce overland flow velocity, reduce runoff volume or trap sediment.*** ***d. Suitable Material. No activity within waters of the U.S. may consist of unsuitable materials, such as trash, debris, car bodies, etc.*** ***e. Management of Water Flows. To the extent practicable, the bridge or culvert will be designed to maintain preconstruction downstream flow conditions. Furthermore, the structure must not permanently restrict or impede the passage of normal or expected high flows, and the structure must withstand expected high flows. Stream channelizing will be reduced to the minimal amount necessary, and the design and construction of the culvert or bridge must, to the extent practicable, reduce adverse effects such as flooding or erosion downstream and upstream of the project site.*** ***f. Adverse Effects from Impoundments. If construction of a bridge or culvert creates an impoundment of water, adverse effects to the aquatic system due to the acceleration of the passage of water and/or the restricting of its flow shall be minimized to the maximum extent practicable.*** ***g. Removal of Temporary Fills. Any temporary fills must be removed in their entirety and the affected areas returned to their pre-existing condition.***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Surface Water (Continued)	conditions and to provide for a broad, wooded riparian corridor. The stream design includes creating braided low-flow channels within the broad stream channel base. Braided channels would maximize wet areas within the base of the constructed channel and would minimize erosive forces. Oxbows and small depressional areas also would be included to increase wetland habitats in the base of the channel. • Ponds retained or constructed on the site as part of the permanent reclamation and mitigation would be integrated into the riparian corridor design and would be constructed with one or more lower floodplain terraces designed at an elevation to be frequently flooded. Where surrounding topography allows, larger ponds would have a second terrace that is designed to be seasonally flooded. To mimic natural conditions and to prevent erosion, side slopes would be gentle (greater than 4:1). Wherever practicable, ponds would be constructed with a shallow planting bench (5 to 10 feet wide, not to exceed 2.5 feet deep) around their perimeter. Native tree, shrub, and herbaceous species would be planted throughout the planting bench and terrace(s) based on their inundation tolerance. • Any oil in the wastewater captured in Sediment Pond FP-1 at the facilities area would be removed by oil separation equipment prior to reuse or discharge of the runoff water. • Alcoa would monitor surface water flow conditions on the Simsboro outcrop adjacent to the mine. If this monitoring detects water use impacts resulting from groundwater drawdown in the Simsboro aquifer, Alcoa would mitigate the impacts. • Alcoa would use appropriate BMPs to control and minimize erosion and sediment generation during construction at any sites outside the mine area where runoff is not captured and treated by the perimeter sedimentation ponds. This includes construction of the	*h. Fills Within 100-Year Floodplains. Alcoa must comply with any applicable FEMA-approved state or local floodplain management requirements.* • *SW-4: Surface Water Flow Mitigation. Based on further evaluation, the USACE has determined that mitigation measure SW-4 as presented in the Draft EIS, which would have required artificial flow augmentation below the proposed TPDES outfalls, should be eliminated from further consideration as it would result in unnatural stream flow conditions during the life of the mine. Alternatively, elimination of this measure would provide for the continuation of conditions similar to existing pre-mining intermittent flows.* • *SW-5: Spring and Seep Mitigation. Prior to the initiation of dewatering or depressurization operations, Alcoa would conduct an additional baseline spring and seep survey of the permit area and surrounding locale. The survey would be conducted in the outcrop areas of the Calvert Bluff and Simsboro Formations. The aerial extent and methodology of the survey would be determined through coordination with the USACE, TCEQ, and TPWD. The survey would consist of site visits using access permission obtained from appropriate landowners. These visits would include landowner interviews to the extent possible. Supplemental survey methods, such as examination of aerial imagery, would be incorporated as necessary. A written report identifying the locations and areas of springs and seeps, their primary uses, and their seasons of occurrence or flow (as appropriate) would be developed and submitted to the agencies identified above. If mine-related impacts occur to springs, they would be mitigated in accordance with RRC and USACE regulatory requirements.*

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Surface Water (Continued)	haul road and associated "walk-arounds" at drainage crossings along the transportation corridor. • A dribble pan would be installed below the conveyor along the length of the crossing at selected drainage crossings to provide secondary protection against possible spillage from upset conditions such as a broken conveyor belt.	• ***SW-6: Bottom Ash Recharacterization Monitoring. Periodic recharacterization of Unit 4 bottom ash would be conducted (for years in which Alcoa intends to use bottom ash at the Three Oaks Mine) on an annual basis from multiple representative samples, and would include analyses for leachable concentrations of arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. The analytical methods and reporting procedures to be implemented would be those required by TCEQ to verify continued classification as a Class III industrial waste.***
Soils	• Selective materials handling and testing would be implemented to ensure placement of suitable plant growth material in the upper 4 feet of the reclaimed spoil material. • Soils on prime farmlands would be salvaged, stockpiled, and replaced to a depth of 4 feet. • Stockpiles of topsoil and subsoil to be left in place more than 30 days would be marked and stabilized. A temporary cover crop, berms, silt fencing, straw bales and other BMPs would be used, as appropriate, to minimize wind and water erosion of the stockpiled materials. • Replaced soils and reconstructed topsoils would be tested to ensure that they are free of acid-forming and toxic-forming materials, and that the soil texture is favorable for the intended post-mine land use. The replaced soil or substitute material would be treated with fertilizer and amendments, as necessary, to ensure successful establishment and growth of vegetation. Testing of soil materials would be repeated at prescribed points during the reclamation bonding period in accordance with RRC requirements.	• ***S-1: Monitoring/Mitigation of Selectively Handled Overburden Relative to Localized Aquatic Resource Protection. In addition to the proposed sampling, analysis, and treatment procedures for reclaimed soil surface characteristics as outlined in Alcoa's RRC permit (see performance criteria listed in Table 2-10a on page 2-43b of the Final EIS), Alcoa would implement the following monitoring and treatment procedures relative to recreated drainage courses*** ***Within 500 feet on both sides of reconstructed drainage courses potentially subject to saturation or shallow water table conditions following spoil recharge (defined herein as areas at or below an elevation of 490 feet NGVD), Alcoa would conduct a supplemental sampling and analysis program for acid base accounting (ABA) and pH. This sampling would be conducted at approximately the same intensity as the sampling conducted for Alcoa's RRC permit (approximately one sample per 5.7 acres); however, discrete samples would be collected at each sampling site for the 0- to 1-foot layer and the 1- to 4-foot layer. Samples would not be composited over multiple sites. These additional samples would be analyzed for ABA and pH. Sites within the upper 4 feet of selectively handled material that yield ABA values of –5 or lower***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Soils (Continued)		***or pH values of 4.0 or lower would be mitigated by in-situ treatment or removal of the unsuitable material and replacement with suitable material.***
Vegetation	• Revegetation would commence during the first favorable planting period after the reconstructed soils have been conditioned and prepared for planting operations. • A temporary cover crop or mulch would be established unless planting occurs in the spring, when a pre-permanent vegetative cover could be established. The use of a pre-permanent cover crop would enhance the survival and growth of the permanent vegetation species by quick establishment of organic mulch materials, high nitrogen-containing residues, and a soil-stabilizing root mass. • Within the riparian corridors of the reclamation area, the lower floodplain terrace, the upper floodplain terrace (where applicable), and the upland buffer would be planted at a minimum rate of 500 native trees and shrubs per acre. Trees and shrubs also would be planted within the base of stream channels at the reduced density of 200 per acre. Trees and shrubs would be planted by hand within scattered groupings on a minimum of 10-foot centers. A minimum of six tree species (no species would comprise more than 30 percent of the planted trees) and four shrub species (no species would comprise more than 30 percent of the planted shrubs) would be planted. Species would be planted at an appropriate elevation based on their inundation tolerance. To additionally enhance floodplain terrace(s) and the upland buffer, a minimum of five native grass and forb species would be seeded throughout. • Trees and shrubs would be planted ~~throughout~~ ***in the portions of*** the Middle Yegua Mitigation Site ***and Big Sandy Mitigation Site intended to become a woodland at densities sufficient to ensure survivorship of a minimum of 140 trees and 60 shrubs per acre (at the end of the first 5 years of annual monitoring)***~~at an~~	• ***V-1: Invasive Plant Species. Alcoa would coordinate with the NRCS to develop a control plan to minimize establishment of invasive plant species.***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Vegetation (Continued)	~~average rate of 400 per acre.~~ A minimum of ~~eight~~ ***ten*** tree species and six shrub species (no species would comprise more than 30 percent) would be planted to ensure species diversity, as well as provide food and habitat for a wide range of wildlife. The excavated depressions would be planted with herbaceous species at a rate of 400 per acre. A minimum of ~~six~~ ***eight*** hydrophytic/aquatic species (no species would comprise greater than 30 percent) would be planted. Species would be planted at an appropriate elevation based on their inundation tolerance. • Aquatic vegetation would be planted around the margins of the end lakes to promote the establishment of aquatic communities. Gradual slopes would be created down to 10 feet below the projected water level.	
Fish and Wildlife	• Disturbance of natural vegetation would be avoided, where practical, in areas scheduled for ancillary activities to minimize disturbance to wildlife habitat. • Land clearing operations would be minimized in advance of the mining operation, where practical. • Brush and other post-logging vegetative debris deemed suitable for use as brush piles would be salvaged and piled in advance of mining operations until such time as it needs to be removed so as not to interfere with mining operations. • Fish and wildlife habitat, as a percentage of the permit area, would increase during concurrent reclamation. Approximately 52 percent of the total disturbance area would be reclaimed and managed specifically as wildlife habitat, and much of the remainder would effectively serve that purpose, as well as providing pastureland for livestock.	• ***FW-1: Raptor Collision Protection. Standard raptor-proofing designs would be incorporated into the design of the new and relocated power lines and the new substation, as applicable, to minimize bird mortalities.*** • ***FW-2: Raptor Electrocution Protection. Standard safe designs would be incorporated into the design of the relocated 14.4-kV power line and the new 25-kV power distribution line in areas of identified avian concern to prevent electrocution of raptors.*** • ***FW-3: Aquatic Monitoring. Alcoa would perform aquatic monitoring of fish and macroinvertebrate organisms at one location each upstream and downstream of the mine outfalls on Middle Yegua Creek. A description of the proposed monitoring follows:*** ***Sample collection and analyses would be performed according to TCEQ guidelines as outlined in their***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Fish and Wildlife (Continued)	• Woody plants would be established along reconstructed drainageways, diversions, ponds, roads, and fence lines. The configuration and distribution of plantings would be designed to maximize edge effect. Habitat diversity and interspersion of vegetation types would be encouraged by planting tree and shrub species in alternating patterns. • Alcoa's fish and wildlife plan for migrating bird species would be implemented at the Three Oaks Mine. Vegetation in proposed disturbance areas would be removed outside of the breeding season (March through July) in advance of construction and mine block development to avoid impacts to nesting birds. Alternately, prior to construction during the breeding season for bird species, a qualified biologist would survey potentially suitable habitat for nesting activity and other evidence of nesting. If active nests are located, or other evidence of nesting is observed, appropriate protection measures, including establishment of buffer areas and constraint periods, would be implemented until the young have fledged and dispersed from the nest area. • Alcoa's current protection plan for the timber/canebrake rattlesnake at the existing Sandow Mine would be implemented at the Three Oaks Mine. This plan includes employee education measures and relocation of any timber/***canebrake*** rattlesnakes found in the mine area to nearby suitable habitat outside the mine area. • The Texas horned lizard, which is state-listed as threatened, potentially could occur in the Three Oaks Mine area, although none have been observed. If the Texas horned lizard is observed or encountered in the permit area, the RRC and TPWD would be notified and a management plan would be developed and implemented in consultation with those agencies. • If other sensitive species are found at the Three Oaks Mine, protection and management plans would be developed in coordination with the jurisdictional agencies.	***1999 Receiving Water Assessment Procedures Manual. The data collected for these samples would be adaptable to the application of statewide and regional metric scoring for aquatic life use.*** ***For fish, sampling would include 15 minutes of electro-shocking and six 60-meter seine hauls per station.*** ***For benthos, three qualitative kicknet samples would be collected per station per TCEQ guidelines.*** ***For quantitative benthic assessment in shallow water, three subsamples would be collected at each station utilizing a surber sampler.*** ***For quantitative benthic assessment in deeper water, three subsamples utilizing an Ekman dredge would be collected at each station.*** ***Fish and benthic samples would be collected from the two station areas during the spring and fall seasons for the first 3 years once mining begins. If, after 3 years, it can be determined that a single spring season sample would represent the sample station areas adequately and no mining effects have been noted, only spring sampling would be continued.*** ***If substantial fish and macroinvertebrate reductions are indicated, Alcoa would manage groundwater discharge, as feasible, to increase releases into Middle Yegua Creek.*** • ***FW-4: Cooperative Radio-telemetry Study with TPWD. Alcoa would coordinate with TPWD, and with TPWD approval would participate in, radio-telemetry studies to determine survivability of relocated timber/canebrake rattlesnakes within the Three Oaks Mine and Sandow Mine permit areas and in Bastrop State Park. In general, the study would require that***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Fish and Wildlife (Continued)	• ~~Groundwater discharge into the Middle Yegua Creek and Big Sandy Creek drainages would increase the quantity and dependability of flow in the upper reaches of these streams, thereby increasing the amount of aquatic and riparian habitat during the discharge period (anticipated to be the life of the mine).~~	***timber/canebrake rattlesnakes captured within the Three Oaks Mine permit area receive radio-telemetry transmitter implants and be released at locations identified in the study plan; potential release sites would include non-impacted areas within the Three Oaks Mine permit area, non-impacted areas within the Sandow Mine permit area, and Bastrop State Park. The movements and survival of the relocated rattlesnakes would be monitored utilizing radio-telemetry receiver equipment. Alcoa's participation in the cooperative study could include allowing supervised access to portions of the Three Oaks Mine and Sandow Mine permit areas; directing employees and/or consultants to participate in study efforts; and contributing funds to be used for purchasing and maintaining equipment, purchasing and maintaining supplies, and/or supporting research personnel.***
Paleontological Resources	• No environmental protection measures are proposed.	• No monitoring or mitigation is being considered.
Cultural Resources	• Alcoa would complete surveys on any remaining areas to be disturbed by mining activities prior to surface disturbance in the area. • No sites would be disturbed until written or signed approval is obtained from the THC, USACE, and RRC. • A site protection plan has been developed and would be implemented in coordination with the THC, USACE, and RRC. • In the event of unanticipated discoveries, Alcoa would contact the USACE and THC and protect the discovery in accordance with appropriate state and federal laws.	• ***CR-1: Indirect Impact Mitigation. Alcoa would develop a policy regarding illegal cultural resource collection, and incorporate an education program regarding this policy into the existing quarterly training program for its mine employees. Alcoa would coordinate with the USACE and THC in developing the policy language.***
Air Quality	• Alcoa would surface all haul roads with gravel and apply water or chemical dust suppressants, as needed, to minimize dust. Alcoa also would limit vehicle speeds to control dust and ensure safety. • Dust filtering devices would be included on crushers and screens, conveyors would be covered on the top and one	• ***AQ-1: Haul Road Construction. Alcoa would construct earthen berms at selected locations within the transportation corridor, as necessary, and gravel the haul road to control the dispersion of particulate emissions generated on the haul road in the vicinity of the mine permit boundary.***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Air Quality (Continued)	side, transfer points would be covered, and dragline dumpling heights would be minimized to reduce fugitive dust generation. • Belt cleaners and a spray wash bar would be utilized at the head pulley of the conveyor to clean the conveyor belt after the coal is discharged. • The conveyor would be constructed using a continuous conveyor design that accommodates horizontal curves, eliminating intermediate transfer points.	
Land Use and Recreation	• The proposed post-mine land uses would result in the restoration of the current rural character of the permit area. A majority of the reclaimed area would be dedicated to wildlife management until the bond is released. Pasture and grazing lands would be revegetated with native species and improved grasses, similar to surrounding pasturelands in the vicinity.	• No additional monitoring or mitigation is being considered.
Social and Economic Values	• No environmental protection measures have been proposed.	• No additional monitoring or mitigation is being considered.
Transportation	• Alcoa would upgrade the transportation infrastructure in the vicinity of the mine.	• No additional monitoring or mitigation is being considered.
Noise and Visual Resources	• Equipment noise effects would be reduced by maximizing the distance between the various noise sources. When possible, the equipment would be oriented such that the loudest noise sources would not be directed toward nearby residences. • Alcoa would control the view to and from public roadways through vegetative screening, berms, and undisturbed buffer areas. Alcoa would preserve existing trees where practical and plant additional vegetative screens, where necessary. • Alcoa would use shielding and directed downlighting to reduce potential glare from operating lights.	• ***N-1: Noise Mitigation. Alcoa would reduce noise effects to sensitive receptors, where possible, by minimizing the simultaneous operation of major noise sources in close proximity to each other. Where possible, equipment with directional characteristics to their noise emissions would be oriented to direct the highest noise levels away from nearby residences. Additionally, all motorized equipment would be maintained in good condition with effective mufflers intact.*** • ***N-2: Noise Barriers. To the degree possible, Alcoa would use temporary spoil piles and topsoil stockpiles as berm-type noise barriers between mine activities and nearby residences. Specific locations to consider for this treatment include the northern end of the mine area where FM 619, CR 304, and FM 696 approach the mine area, and at the southern end of***

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Noise and Visual Resources (Continued)		*the mine area where CR 126 hosts a cluster of homes and a church school. Other areas also may be appropriate for consideration, depending on local terrain and vegetation.* • *N-3: Sound Control. Alcoa would investigate various methods for reducing the pure tonal character of dragline noise. Should these studies indicate that there is a modification that is both economically and technically feasible and that demonstrably reduces dragline noise, Alcoa would implement the modification.* • *VR-1: Visual Screening. In those areas where the edge of the active mine is near the permit boundary (e.g., portions of the western edge) and there are sensitive receptors nearby, Alcoa would design edge conditions to minimize negative visual effects. In particular, existing vegetation would be preserved and augmented as necessary to maximize visual screening. Where possible, berms of adequate height would be placed as close to the receptor as feasible. Berming and planting should be designed to mimic natural topography, vegetation patterns, and planted to provide screening and to control erosion.* *Similar efforts at retaining and enhancing vegetative and topographic screening would be made at the shop/office area to soften the visual effect of the industrial buildings and to screen this area from residences in the Willow Creek subdivision. Existing vegetative screening adjacent to the transportation and utility corridor would be preserved and enhanced to minimize the visual effects of the long linear feature. Overpasses would be planted with screening materials to minimize their visual impact, consistent with TxDOT safety standards.*

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures Analyzed as Part of the Proposed Action	Additional Mitigation Measures Adopted as a Result of the NEPA Process[1]
Noise and Visual Resources (Continued)		• ***VR-2: Landforms. The post-mining, reclaimed landscape would be configured to exhibit irregular landforms and patterns consistent with the existing topography, within the constraints of the permit limitations on slopes and stability. Shrub and tree plantings would be initiated as soon as possible after recontouring the mined areas to facilitate the return of the landscape to a natural appearance.***
Hazardous Materials	• Fuel storage facilities would include concrete spill containment structures to allow for identification and containment of accidental spills. • Waste oils and lubricants would be shipped to a licensed recycler during both construction and operation.	• No additional monitoring or mitigation is being considered.

[1]*This entire column has been revised in the Final EIS. In preparing the Final EIS, the USACE evaluated the draft mitigation measures that were under consideration in the Draft EIS. In the Final EIS, the USACE added additional measures, deleted specific measures, and revised existing measures, all of which are presented in this column and will be required.*

Rockdale
Reckdale West
Turkey Creek
Thorndale
Thrall
Taylor
Brushy Creek
Alcoa Lake
Milam County
Sandow Permit Area
Williamson County
Lee County
Middle Yegua Creek
Three Oaks Permit Area
Three Oaks Mine Area
Travis County
Elgin
Lexington
Lee County
Bastrop County
West Yegua Creek
Cedar Hills
McDade
Paige
Giddings
Colorado River
Bastrop

Potentially Interrelated Actions

Figure 2-15

Three Oaks Mine

Legend

1. Sandow Mine
2. Rockdale Power Generating Station
3. Rockdale Aluminum Smelter
4. Clay Mining & Brick Manufacturing
5. Powell Bend Mine
6. Lost Pines 1 and Sim Gideon Power Plants

Source: Adapted from Alcoa 2001c.

Figure revision: Added county boundaries.

N

0 1 2 Miles

1/29/03

Based on this approach, the following actions have been identified as reasonably foreseeable actions to be addressed in this EIS.

2.6.2.1 Sandow Mine Closure and Reclamation

As described in Section 1.1.2.1, the Sandow Mine is an existing lignite mining operation that has been operating since the1950s. ***Alcoa proposes to coordinate Sandow Mine closure with Three Oaks Mine construction and operation. The schedule for Sandow Mine closure will depend on permitting and transition schedules for Sandow and Three Oaks and economic factors.*** Alcoa currently proposes to begin ***Sandow*** ~~m~~***M***ine closure and reclamation in 200***3***~~2~~; Alcoa estimates that closure and reclamation activities would be completed ~~with~~in approximately ***2008***~~5 years~~. These activities would include reducing the slopes of the final pit to create the final end lakes, removal of ancillary mine facilities, and final grading and revegetation of disturbed lands. Sandow Mine closure would result in the termination of groundwater dewatering and depressurization pumping and surface discharge of this water. However, ~~4,443 gpm~~ ***approximately 5,000 acre-feet per year*** of groundwater would continue to be pumped from the mine site for ongoing industrial use.

2.6.2.2 San Antonio Water System Contract

The 1998 SAWS contract is a long-range water supply contract between Alcoa and SAWS for 40,000 to 66,000 acre-feet of groundwater per year from Alcoa and CPS lands to the City of San Antonio (SAWS 1998). In 2001, SAWS revised its projected need to be approximately 40,000 acre-feet (SAWS 2001). The proposed term of water supply is from 2013 to 2038, with a possible 40-year extension. Alcoa would provide up to 40,000 acre-feet per year from ~~depressurization~~ wells located in the Sandow Mine area in the Simsboro Formation. Concurrently, SAWS, through a separate contract with CPS, would produce up to 15,000 acre-feet per year from the CPS property at Three Oaks. The Alcoa-SAWS contract stipulates that: 1) groundwater withdrawals for the SAWS/CPS contract may not interfere with Alcoa's lignite mining operations; 2) lignite mining may result in a reduction in groundwater provided for the contract of up to 15,000 acre-feet per year; and 3) the City of San Antonio has agreed to adhere to the same groundwater well mitigation requirements as lignite mining operations (i.e., mitigation for well impacts caused by the drawdown of groundwater pumped for SAWS) (see Section 2.5.4). Based on these stipulations, SAWS water production from CPS lands would be a maximum of 15,000 acre-feet per year inclusive of any water produced from the proposed Three Oaks Mine.

The groundwater pumpage for SAWS is independent of the proposed Three Oaks Mine (i.e., SAWS could be implemented with or without Alcoa's development of the Three Oaks Mine). For purposes of this impact assessment, it is assumed that groundwater pumped for the SAWS contract would be conveyed via a pipeline directly from the well field to San Antonio without being discharged into any local drainages or surface impoundments.

2.6.2.3 Groundwater Withdrawal for Bryan-College Station Area

No published agency estimates are available regarding the long-term changes in groundwater withdrawal for the Bryan-College Station area. For purposes of this impact analysis, it is assumed that overall municipal

2.6.2.4 Groundwater Withdrawal for Other Municipal, Industrial, and Agricultural Uses

Groundwater withdrawals in the local area encompassing Lee and Bastrop Counties, as well as for the Bryan-College Station area, are assumed to increase in response to projected population growth for these counties. Based on U.S. Bureau of Census data, these growth projections for the period from 2000 to 2030 are approximately 40.1 percent for Lee County and 133.9 percent for Bastrop County, or 113.9 percent overall. Projections of estimated groundwater withdrawal are discussed in Section 3.2.3.3.

2.6.2.5 Future Population Growth

Growth projections for the three-county study area over the 25-year life of the Three Oaks Mine suggest a continuation of recent trends. The result would be a very substantial population increase in Bastrop County and more modest increases in Lee and Milam Counties. Bastrop County's population is expected to ~~nearly triple~~ ***more than double*** by 2030 to a total of ~~154,987~~ ***125,339*** people. The average annual growth rate is projected at ~~3.3~~***2.6*** percent, which is notably lower than the 4.2 percent per year from 1990 to 2000, but still substantial. Lee County is projected to grow at ~~2.1~~ ***1.3*** percent per year, ~~virtually the same as~~ **somewhat less than** the 2.0 percent rate since 1990. The resulting increase would be ~~13,862~~ ***7,357*** people added to the 2000 census total of 15,657 for a total of ~~29,519~~***23,014***. Milam County is projected to grow at a ~~1.2~~***0.5*** percent average annual rate through 2030, increasing by ~~9,931~~***4,250*** people to a total population of ~~***34,169***~~***28,488***. The annual rate would be ~~more than double~~ ***the same as*** the rate over the past decade; ~~however,~~ it still would be the lowest of the three counties (Texas Comptroller of Public Accounts ~~1998~~***2002***).

The difference in growth pressures among the three counties is likely related to the proximity and ease of access from Bastrop County to the rapidly growing Austin metropolitan area. Neither Lee nor Milam Counties is in a comparable location with the access afforded by U.S. Highway 290.

2.6.2.6 Transportation Projects Unrelated to the Proposed Three Oaks Mine Project

The TxDOT and Bastrop, Lee, and Williamson Counties have identified the following potential road construction projects in the vicinity of the proposed Three Oaks Mine during the anticipated schedule of project construction and operations.

- U.S. Highway 290
  Description – widen highway to 4-lane divided highway
  Location – from State Highway (SH) 95 to 1 mile east of FM 696
  Schedule – August 2003 to May 2005

- U.S. 290
  Description – widen highway to 4-lane divided highway
  Location – from 1 mile east of FM 696 to Giddings
  Schedule – estimated to begin in approximately 2009 (Note – this is a long-range planning project that has not yet been funded)

- CR 466 (Williamson County)
  Description – widen road ROW
  Location – from FM 619 to CR 463
  Schedule – estimated 2003

2.6.2.7 Proposed Regional Habitat Conservation Plan for the Houston Toad

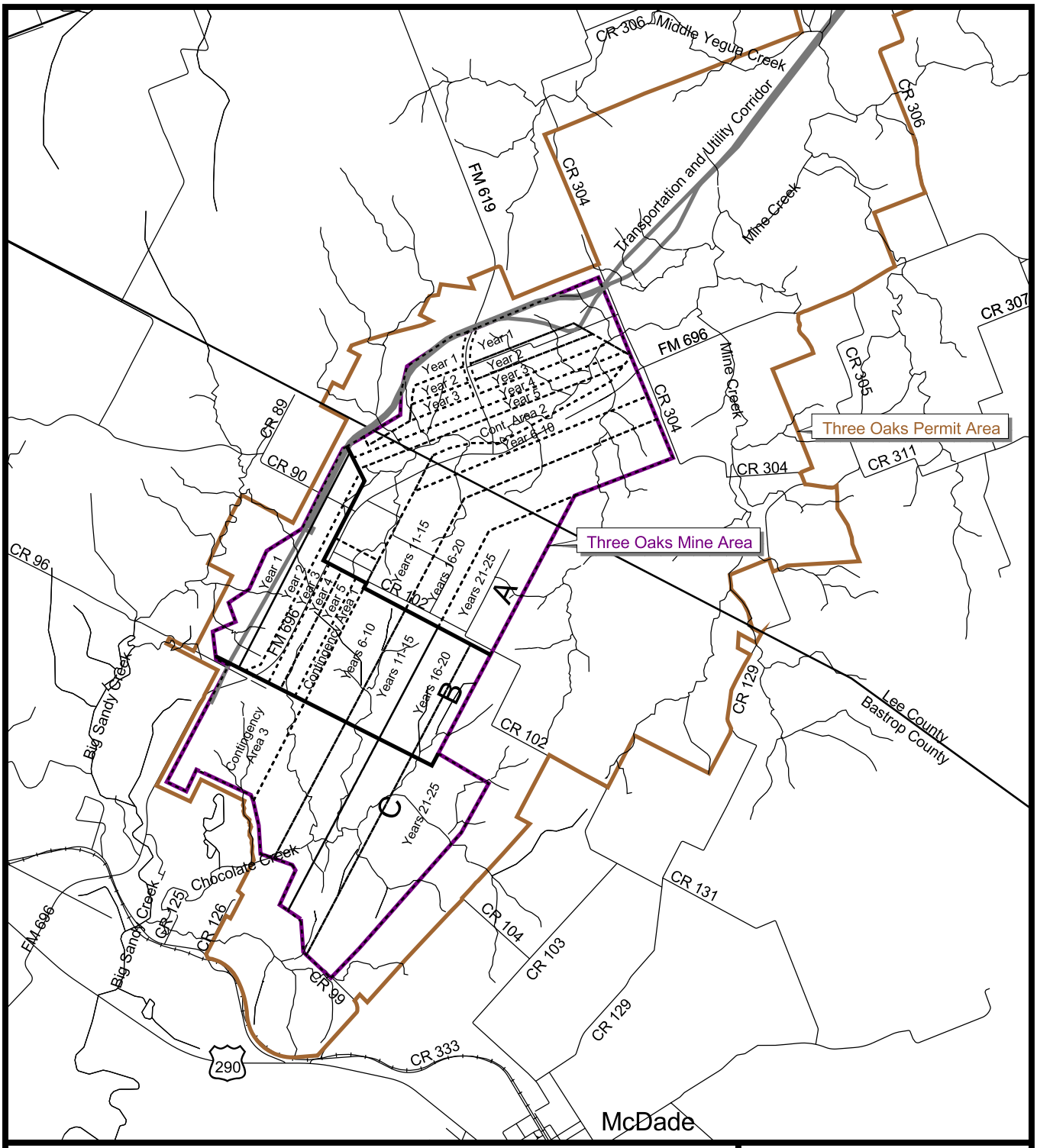
The Bastrop County Stakeholder Workgroup is currently preparing a habitat conservation plan (HCP) to cover the potential incidental take of Houston toads on approximately 126,000 acres in Bastrop County; the HCP area is to the east of the proposed Three Oaks Mine permit area. The HCP will apply to the following actions in Bastrop County: residential and commercial construction, utility construction and maintenance, timber harvesting, land conversion from native to non-native sod (including clear cutting), ancillary home agriculture and public land activities (e.g., fence repair), fire suppression, prescribed burns, and understory clearing. The target date for implementation is December 2002.

2.6.2.8 Proposed Utilities Habitat Conservation Plan for the Houston Toad

Aqua Water Supply Corporation, Austin Energy, Bluebonnet Electric Cooperative, Inc., and the Lower Colorado River Authority (LCRA) are proposing an HCP to cover the incidental take of Houston toads during the installation of linear and fixed-foundation facilities and during the routine repair and maintenance of these facilities. The preliminary area to be addressed by the HCP includes areas of Bastrop and Lee Counties, to the east of the proposed Three Oaks Mine permit area. This HCP is in preparation, and 2002 is the target year for implementation.

2.7 Description of Alcoa's Alternate Mine Plan (RRC-approved Plan)

Due to delays in obtaining final approvals regarding the relocation of state highway FM 696, state highway FM 619, and Bastrop CR 90, Alcoa proposed an Alternate Mine Plan designed to facilitate commencement of mining activities at the Three Oaks Mine without immediate relocation of these roads. The RRC has approved this plan as shown in Figure 2-16. Under the alternate plan, substantial mining could occur prior to any approvals being obtained from Bastrop County and TxDOT for relocation and modification of the abovementioned roads. If Alcoa cannot arrange for the reroute of FM 619 or CR 90 in a timely manner, the area would be split into two mine blocks during the first 3 years of actual mining. Draglines could be located in the mining blocks north of FM 619, south of FM 619 and north of diversion CD-1, or between CR 90 and CR 96 and east of FM 696. All operations would be consistent with Alcoa's surface-water control plan described for the Proposed Action. An at-grade crossing would be provided for FM 619 and CR 90, and a culvert installation would route diversion CD-1 under the existing FM 619. The culvert installation would consist of three 4-foot by 8-foot box culverts that were sized in the detailed design plans for the crossing of



Source: Adapted from Alcoa 2001c.

Three Oaks Mine

Figure 2-16

Alternate
Mine Block Sequence

CR 304 by the CD-1 diversion, which is located downstream of the proposed FM 619 crossing. A dragline crossing of FM 619 and CR 90 also would be required, subject to approval from TxDOT and Bastrop County, respectively.

Highway FM 619 would be relocated sometime during the first 3 years of mining, and Alcoa would proceed with its preferred plan. A small portion of the original Years 1, 2, and 3 mine blocks would be mined during Year 4. This small change in mine blocks would not affect the postmining contour map. If approval to reroute the state highways and Bastrop County roads is not obtained in the first 3 years of mining, Alcoa would need to further modify its mine plan to enable continued operations while avoiding these roads.

The exact timing of the road reroutes is not known; therefore, it is not possible to define the year-by-year variance from Alcoa's preferred mine plan in overburden volumes, disturbed acres, reclaimed acres, prime farmland impacts, and road relocation schedules. However, the quantities and timing would vary little from those quantities and schedules depicted in the original plan (see Section 2.5, Description of Alcoa's Preferred Alternative [Proposed Action]).

The amount of lignite mined annually under the alternate mine plan would not vary, or would vary little, from the amount that would be mined under Alcoa's preferred plan. Currently, the power plant consumption averages approximately 6.2 million tons per year. This consumption could increase to an average of 7 million tons per year, depending on the technology Alcoa uses to achieve emissions reductions at its power units. Whether operating under the alternate plan or under the preferred plan, the same amount of lignite would be produced annually at the Three Oaks Mine.

The amount of overburden/interburden moved to access lignite seams with the alternate plan would be similar to Alcoa's preferred plan. The mine blocks would be shortened with the alternate plan to allow public road corridors to remain in place; however, the amount of lignite production must remain constant. Consequently, the mine blocks would extend farther downdip to uncover additional lignite to make up for the lignite left under the roads. The resulting mine disturbance would be nearly the same as under the preferred plan. Rough calculations indicate that the Year 1 mine block would be 12 acres smaller under the alternate plan than under the preferred plan, the Year 2 mine block would be 7 acres smaller, and the Year 3 mine block would be 5 acres smaller, cumulatively resulting in a 24-acre decrease in mining-disturbed acreage.

The alternate mine plan anticipates that approvals for road relocations would be obtained during the first 3 years of mining. Subsequently, the road corridors that were to remain open during the first 3 years of the alternate plan would be mined during the fourth year, and, as a result, the Year 4 mine block would be 24 acres larger under the alternate plan than in the preferred plan. The Year 5 mine blocks and all other future mine blocks would be identical to the preferred plan. This is because the alternate mine plan would transition to the preferred plan after the road relocations are completed and the road corridors have been mined.

If the alternate mine plan proceeds as anticipated, the reroute of FM 619 and FM 696 could be delayed for up to 3 years. Likewise, reroute of Bastrop County CR 90, and the associated upgrade of CR89, could be delayed for up to 3 years.

The average number of acres in a state of disturbance at any point in time (approximately 640 acres) would not change under the alternate mine plan. There are differences in reclamation acreages during the first 5 years, but the differences would be small and would have no impact on the overall annual average of disturbed acreage.

2.8 Comparative Analysis of Alternatives

Table 2-16 summarizes and compares the projected environmental impacts of the Proposed Action and the No Action Alternative. ***A summary of the projected environmental impacts of the Alternate Mine Plan, as it differs from the Proposed Action, is presented in Table 2-17***. Detailed descriptions of the impacts are presented in Chapter 3.0, Affected Environment and Environmental Consequences. The summarized impacts assume the absence of potential mitigation measures; implementation of the monitoring and mitigation measures identified in Chapter 3.0, and summarized in **Table 2-15~~6~~**, would potentially reduce the impacts. Impacts are referred to as "short-term" through the life of the mine and reclamation or "long-term" if they persist beyond mine closure and reclamation.

Table 2-16 (Continued)

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Water quality.	No adverse impacts following implementation of surface water management plan and TPDES permit provisions.	No effects on water quality from mine construction or operation.
Erosion and sedimentation.	No adverse impacts following implementation of reclamation plan, surface water management plan, and TPDES permit provisions.	No surface disturbance from mine construction or operation.
Surface water rights and beneficial uses.	No adverse impacts to limited rights and by compliance with alternative water supply mitigation requirements in 16 TAC Part 1, Chapter 12, Subchapter G, Division 5, Rule 12.130, as necessary.	No effects on water uses from mine construction or operation.
Loss of waters of the U.S., including wetlands.	A total of 67.4 acres of jurisdictional waters of the U.S. temporarily would be impacted as a result of mine construction and operation. This includes 5.3 acres of wetlands, 23.6 acres of jurisdictional streams (ephemeral and intermittent), and 38.5 acres of on-channel ponds. ~~Alcoa's mitigation and enhancement program would result in a net increase of approximately 34.9 acres of waters of the U.S.~~ ***These affected waters of the U.S. would be mitigated and/or replaced in accordance with Alcoa's Mitigation Plan (see Appendix E of the Final EIS)***. Additionally, 73.5 acres of waters of the U.S. may be affected within the Simsboro outcrop where aquifer depressurization may affect surface water availability.	No change in wetlands or waters of the U.S. caused by mine construction or operation.
Soils		
Accelerated erosion in disturbed areas.	Impacts to soils would be minimized with the implementation of erosion control measures.	Existing soils would not be disturbed or removed by mine construction or operation.
Vegetation		
Impact to native Post Oak Savannah vegetation.	Long-term loss of woody species and short-term loss of herbaceous vegetation.	Vegetation would not be affected by mine construction or operation.
Impacts to wetland and riparian vegetation.	See wetlands and waters of the U.S. for impacts to wetlands. Riparian vegetation associated with springs or seeps in the Simsboro outcrop area and along the Big Sandy and Middle Yegua Creeks would be affected by changes in water levels and surface flows.	Wetlands and riparian areas would not be affected by mine construction or operations.

Table 2-17
Impact Summary of the Alternate Mine Plan as it Differs from the Proposed Action[1]

Resource/Impact Issue	Impact
GEOLOGY AND MINERAL RESOURCES	
Modification of topography in the permit area.	*Same as the Proposed Action (beyond year 4 of mining).*
Removal of the lignite resource making it unavailable in the future.	*Same as the Proposed Action.*
GROUNDWATER	
Groundwater level declines in aquifer outcrop areas.	*Same as the Proposed Action.*
Groundwater level declines in private and municipal wells.	*Same as the Proposed Action.*
SURFACE WATER	
Removal of surface water features.	*Same as the Proposed Action.*
Flow effects of watershed modifications.	*Same as the Proposed Action.*
Flow effects from groundwater discharges to streams.	*Same as the Proposed Action.*
Flow effects on streams and springs from groundwater drawdown.	*Same as the Proposed Action.*
WATER QUALITY.	*Same as the Proposed Action.*
Erosion and sedimentation.	*Same as the Proposed Action.*
Surface water rights and beneficial uses.	*Same as the Proposed Action.*
Loss of waters of the U.S., including wetlands.	*Same as the Proposed Action.*
SOILS	
Accelerated erosion in disturbed areas.	*Same as the Proposed Action.*
VEGETATION	
Impact to native Post Oak Savannah vegetation.	*Same as the Proposed Action.*
Impacts to wetland and riparian vegetation.	*Same as the Proposed Action.*
Establishment of invasive plant species.	*Same as the Proposed Action.*
Impacts to loblolly pines of the Lost Pines Region from drawdown.	*Same as the Proposed Action.*
Impacts to economically harvestable vegetation.	*Same as the Proposed Action.*
Impacts to special status plants species.	*Same as the Proposed Action.*
FISH AND WILDLIFE	
Loss of aquatic habitat from mining.	*Same as the Proposed Action.*
Habitat reduction due to reduced runoff and water level changes.	*Same as the Proposed Action.*
Habitat increases due to mine water discharges.	*Same as the Proposed Action.*
Direct habitat loss or alteration.	*Same as the Proposed Action.*
Disturbance to nesting raptors and other migratory birds.	*Same as the Proposed Action.*
Utility line impacts on raptors and other migratory birds.	*Same as the Proposed Action.*
Impacts to special status wildlife species.	*Same as the Proposed Action.*
PALEONTOLOGICAL RESOURCES	
Disturbance to unique or significant paleontological resources.	*Same as the Proposed Action.*
CULTURAL RESOURCES	
Direct impacts to cultural resources.	*Same as the Proposed Action.*
Potential impacts to previously undiscovered significant sites.	*Same as the Proposed Action.*
Potential indirect impacts to cultural resources.	*Same as the Proposed Action.*
AIR QUALITY	
Potential exceedence of ambient air quality standards.	*Same as the Proposed Action.*
LAND USE AND RECREATION	
Compliance with local plans and policies.	*Same as the Proposed Action.*

Table 2-17 (Continued)

Resource/Impact Issue	Impact
Potential destruction of Post Oak Savanna and farmland.	*Same as the Proposed Action.*
Loss of agricultural productivity (agricultural wells) due to lowered water table.	*Same as the Proposed Action.*
Loss of agricultural productivity (flow reductions in springs and stream baseflows) due to lowered water table.	*Same as the Proposed Action.*
Change in recreation demand or available supply.	*Same as the Proposed Action.*
Loss of wildlife viewing and hunting opportunities due to habitat loss.	*Same as the Proposed Action.*
Impacts on state parks.	*Same as the Proposed Action.*
SOCIAL AND ECONOMIC VALUES	
Population change.	*Same as the Proposed Action.*
Employment and income change.	*Same as the Proposed Action.*
Changes to local public finance.	*Same as the Proposed Action.*
Change in demand for public services.	*Same as the Proposed Action.*
Impact on schools.	*Same as the Proposed Action.*
Decline in property values.	*Same as the Proposed Action.*
Reduced growth potential for Lee and Bastrop Counties.	*Same as the Proposed Action.*
Loss of quality of life.	*Same as the Proposed Action.*
TRANSPORTATION	
Change in travel distance/time due to roadway relocations and modifications.	*Same as the Proposed Action, except effects (including roadway improvements) for FM 696, FM 619, and CR 90 would be delayed until mine Year 4. Slight degradation in highway safety for these roads as a result of mine-generated traffic until road improvements are made.*
Compliance with Level of Service (LOS) standards.	*Same as the Proposed Action.*
Heavy truck traffic.	*Same as the Proposed Action.*
Highway safety.	*Same as the Proposed Action.*
NOISE AND VISUAL RESOURCES	
Loss of rural landscape character and vegetation diversity.	*Same as the Proposed Action.*
Light and glare interference with views of the night sky.	*Same as the Proposed Action.*
Dust emissions affecting local visual quality.	*Same as the Proposed Action.*
Annoyance noise levels at sensitive receptors.	*Same as the Proposed Action, with the exception that mining operations briefly would return to the west and northwest edges of mine area during Years 2 and 3.*
HAZARDOUS MATERIALS	
Generation of hazardous wastes.	*Same as the Proposed Action.*
Spill of hazardous materials during transportation.	*Same as the Proposed Action.*
Spill of hazardous materials during storage and operation.	*Same as the Proposed Action.*
PUBLIC HEALTH	
Impacts to health of local population.	*Same as the Proposed Action.*
ENVIRONMENTAL JUSTICE	
Low income or minority population disproportionately affected.	*Same as the Proposed Action.*

[1]The summary of impacts associated with the Proposed Action is presented in Table 2-16 of the Draft EIS.

CHAPTER 3
AFFECTED ENVIRONMENT
AND ENVIRONMENTAL CONSEQUENCES

3.1.1.4 Geologic Hazards

Seismicity

The project area is located in a Seismic Hazard Zone 0, the lowest seismic hazard risk (International Congress of Building Officials 1997). Historical earthquakes in the vicinity of Austin, Texas, have been attributed to the Balcones Fault Zone and the Luling Fault Zone (Davis et al. 1989). The earthquakes occurred more than 100 years ago and were of magnitude 4.0 on the Richter scale or less. Although there exists a potential for earthquakes to occur in the vicinity of the permit area, the potential ground motion is expected to be low, and resultant seismic hazards are considered to be minimal (Algermissen et al. 1990).

Landslides

The permit area is located in a region with low landslide susceptibility and low landslide incidence (Radbruch-Hall et al. 1982). Landslide hazards resulting from natural conditions are expected to be minimal.

3.1.1.5 Mineral Resources

Lignite Resources

Near-surface (up to 200 feet deep) total coal resources (including lignite) in Texas are estimated to be 23.4 billion tons (Kaiser et al. 1980). The lignite resource is found in the Wilcox Group, the Yegua Formation, and the Jackson Group (**Figure 3.1-8**). The Wilcox Formation in the East-Central Region (as defined by Kaiser et al. 1980) contains approximately 28 percent, or 6.481 billion tons, of the near surface lignite resources. The East-Central Region extends from just west of the Colorado River in Bastrop County to northern Robertson County. The East-Central Region generally coincides with the area where the Wilcox is subdivided into the Hooper, Simsboro, and Calvert Bluff, although the Simsboro outcrop is recognizable further north into Freestone County (Ayers and Lewis 1985). The total lignite production from these resources between 1979 and 2000 are shown in **Figure 3.1-9**. The highest quality lignite is found in the Wilcox Group north of the Colorado River with heat content of approximately 6,500 British thermal unit per pound (BTU/lb). The lowest grade lignite is in the Jackson Group with a heat content of approximately 4,500 BTU/lb.

As described above, the mineable lignite in the permit area is found in seven seams. The lignite resource contains an average moisture content of approximately 32 percent, average ash content of approximately 19.1 percent, average sulfur content of 1.3 percent, and a heat content of ~~6,100~~ ***6,175*** BTU/lb (Alcoa 2000 [Volume 2]***; Hodges 2002d***). The mineable resource in the mine area consists of approximately 175 million tons (Alcoa 2000 [Volume 8]).

Oil and Gas Resources

There are no active oil or gas wells within the permit area; however, there are several abandoned oil and gas test wells (RRC 2001; Alcoa 2001b [Volume 2]). There are three active producing oil wells northwest of

the permit area in the Big Sandy Creek area in Bastrop County. There are no major oil and gas fields in the vicinity of the permit area, but there is potential for commercial oil and gas resources in the Cretaceous rocks that underlie the deposits of the Wilcox and Midway Groups (**Figure 3.1-5**). Sands in the lower part of the Midway have yielded commercial quantities of oil to the west of the permit area (Sellards 1929).

Industrial Minerals

There are several geologic units in the vicinity of the permit area that provide clay (Sellards 1929). These units are the Navarro (Cretaceous), Midway, Calvert Bluff, Yegua, and alluvial deposits. Development of local clay pits began in the 1870s to provide raw materials to the emerging brick industry (Alcoa 2000 [Volume 1]). The Butler Brick Company was founded in 1873 at the community of Butler and grew through acquisitions and mergers with other local brick manufacturers to become the current Elgin-Butler Brick Company. In the vicinity of the permit area, the Calvert Bluff Formation is the source of the clay used for brick and pottery, and clay pits and brick operations are present between the permit area boundary and U.S. Highway 290 (see Section 2.6.1.4).

3.1.2 Environmental Consequences

3.1.2.1 Proposed Action

Topography

The topography of the mine area would be altered considerably during mining activities due to the location of active mine pits and soil stockpiles. Reclamation plans provide for the restoration of the ground to approximate original contours to the extent possible. However, the topography in the vicinity of the end lakes permanently would be altered with the creation of more regular and rounded landforms having more uniform slopes and less drainage dissection. ***If the four uncontrolled parcels in the eastern and southern portions of the mine area cannot be obtained by Alcoa, the modification in the mine area to accommodate these parcels, as described on page 2-21 of the Final EIS, would result in minor changes to the post-mining topography. These changes would occur in the immediate vicinity of the excluded parcels, which would not be disturbed, and along the southeastern edge of the mine area, where mining activity would be extended to offset the exclusion areas. These changes also would result in modifications to the shapes of the end lakes.***

Geology

In the mine area, lignite and overburden would be removed, and the original characteristics of the material would be permanently altered by the disruption of any existing stratification. Potential effects of this alteration are addressed in Section 3.3, Soils.

Geologic Hazards

Natural geologic hazards are not expected to affect the proposed project. The surface mine highwalls are anticipated to be stable and dewatering and depressurization are not anticipated to cause subsidence; therefore, the proposed project is not anticipated to create geologic hazards.

constrained during active mining. There would be a loss of clay resources due to the removal and subsequent mixing of overburden materials from the Calvert Bluff Formation that would render the clay unsuitable for potential future processing into brick.

3.1.2.2 No Action Alternative

The impacts to topography, geology, and mineral resources as described for the Proposed Action would not occur under the No Action Alternative.

3.1.2.3 Alternate Mine Plan

Under the Alternative Mine Plan, potential mine-related impacts to topography, geology, and mineral resources, as well as the potential impacts to the proposed project as a result of geologic hazards, would be the same as described for the Proposed Action (see Section 3.1.2.1 of the Draft EIS).

3.1.3 Cumulative Impacts

The past and present impacts to topography, geology, and mineral resources of the Sandow Mine are similar to the anticipated impacts of the Three Oaks Mine, since the Three Oaks Mine is replacing the Sandow Mine. Cumulatively, the Sandow and Three Oaks Mines would alter the topography of approximately 23,737 acres.

For almost 100 years, clay has been mined by Elgin-Butler Brick; the mining has impacted approximately 300 acres. A reported 80 years of clay reserves remain. Impacts from clay mining would occur whether or not the proposed Three Oaks Mine becomes operational and would contribute to cumulative impacts to mineral resources within the region.

Although oil and gas resources have not been discovered to-date in the mine area, economical resources may be present. Although mining operations may make potential future oil and gas drilling problematic, it would not preclude the recovery of oil and gas. Therefore, the Proposed Action would not result in cumulative impacts related to oil and gas production.

Potential cumulative impacts relate to potential future lignite mining of the Wilcox Group in the East-Central Texas lignite area as defined by Kaiser et al. (1980). The 175 million tons of lignite to be mined over 25 to 30 years at the Three Oaks Mine represents only 2.8 percent of the near-surface lignite resource of the Wilcox Group in East-Central Texas. In the late 1970s, projected lignite demand indicated a demand for 200 million tons of lignite per year by the year 2000 (BLM 1980a). U.S. Department of the Interior, OSM (2001) statistics indicate that Texas coal (primarily lignite) production peaked at 54.8 million tons in 1996 (**Figure 3.1-9**). Preliminary production estimates for the year 2000 indicated a production of 50 million tons. The graph in **Figure 3.1-9** shows no discernable upward trend for future lignite production. Lignite production at the Three Oaks Mine is intended to replace the production at the Sandow Mine. As a result, the Three Oaks Mine production would not incrementally increase overall Texas production. In addition, the RRC has indicated that other than the Three Oaks Mine, no other permit applications for new mines have been submitted, nor have any potential applicants approached the RRC concerning future mining in the Bastrop, Lee, and Milam Counties area (Walter 2001). The only recent exploration activity in the vicinity was

3.2 Water Resources

The principal groundwater issues associated with the proposed Three Oaks Mine include the potential impacts of groundwater drawdown on water quantity and water quality in the affected aquifers. The principal surface water issues include the potential impacts to streams, seeps, and springs from groundwater drawdown and surface water discharge, and the potential impacts from mine-related surface disturbance and changes in watershed areas.

This section describes the affected environment for groundwater, surface water, and waters of the U.S. including wetlands. Highly technical information and data as well as descriptions of the groundwater models used for impact assessment are provided in Appendix C of this EIS.

3.2.1 Hydrologic Setting

The proposed Three Oaks Mine is located in the Gulf***-Atlantic Rolling*** ~~Coastal~~ Plains physiographic province of Texas (~~Bureau of Economic Geology 1996~~***USGS 1970***). The project area is located on the transition between two physiographic subprovinces, the Interior Coastal Plain and the Blackland Prairies. Topography in the region is dominated by rolling hills intersected by swales and wider alluvial valleys. Elevations in the proposed permit area range from 435 to 565 feet NGVD, and both higher and lower elevations occur in the region around the permit area. The Three Oaks Mine permit area drains to both the lower Colorado River drainage to the west and south and to the Brazos River drainage to the north and east (see **Figure 3.2-1**). Within the region, the divide trends generally from west-northwest north of Elgin to east-southeast near McDade. Elevations along this divide reach approximately 650 feet NGVD north of Elgin. This divide also separates surface drainage in the southernmost portion of the permit area from the surface drainage in the remainder of the permit area, which flows eastward to the Brazos River.

In contrast to the thin, red, sandy and clayey soils commonly occurring in the Interior Coastal Plain physiographic subprovince, the soils in the Blackland Prairies physiographic subprovince generally weather to deep, organically enriched, fertile clays. Additional information regarding soil resources is presented in Section 3.3, Soils. Their hydrologic characteristics are further discussed below in Section 3.2.4, Surface Water. The project area occurs within the Prairie and Lakes ecoregion, which includes the Oak Woods and Prairies and the Blackland Prairies (TPWD 1996, 2000a). Additional information on the vegetation types within this ecoregion is presented in Section 3.4, Vegetation. These vegetation types are interspersed with wetlands and riparian communities along drainages and in isolated depressions.

3.2.1.1 Hydrometeorology

The project area occurs in a Subtropical Humid climatic type (State Climatologist undated). The regional climatic characteristics are largely determined by the onshore flow of tropical maritime air from the Gulf of Mexico. Precipitation amounts are typically larger in late spring and fall. The wettest months generally are April, May, June, September, and October (Alcoa 2000 [Volume 5]). The driest months of the year typically are January, March, July, and August.

The TNRCC is the State's primary water rights and environmental regulatory authority. The agency was formed in 1993 and combines the former roles of the Texas Water Rights Commission, Texas Board of Water Engineers, Texas Water Pollution Board, Texas Air Control Board, Water Well Drillers Board, and Board of Irrigators (TNRCC 2001a). With regard to water resources issues in this EIS, TNRCC is responsible for administering water rights, enforcing state water quality regulations, and enforcing Section 401 of the CWA. The Texas Clean Rivers Program, administration of state water quality standards, and the State's 401 Certification Program are major water quality-related responsibilities of TNRCC. In addition, TNRCC administers the TPDES program. Municipal and many types of industrial discharges to surface waters of the state are regulated under this program. The water rights and water quality aspects of TNRCC programs relevant to the project are described in general below.

Water rights in Texas pertain to both surface water and groundwater; however, only surface water rights are administered through a system of recorded riparian and appropriated rights. Surface water***, including flow from springs,*** is considered property of the State, whereas groundwater is considered the property of the owner of the surface estate. The “Rule of Capture” applies to groundwater resources in Texas. Significant aspects of this include (Caroom 1997):

- The owner of the land may pump unlimited quantities of water from under the land for beneficial use, regardless of the impact that action might have upon a neighbor's ability to obtain water on the neighbor’s land. Neither injunction nor damages prevent such action.

- Generally, surface water rights attach only after water has emerged from the ground. Prior to such emergence, the groundwater user can utilize any amount of water, regardless of the impact upon others.

- The surface estate owner may sell the groundwater captured below the surface estate for offsite use by a third party. The transport and use of groundwater at a distant location is permissible even though a majority may be lost in transit.

One exception to the general rule regarding groundwater is that underflow (~~that part of discharge~~***groundwater flow*** ~~in~~ ***immediately below*** a watercourse that flows through sand and gravel deposits beneath the surface of the streambed) is considered to be property of the State. In addition, wanton and willful waste of groundwater resources, or malicious pumping with the purpose of injuring a neighbor, is prohibited, as is negligent pumping that causes subsidence of neighboring land. In addition to the common law restrictions, landowners in many areas are subject to regulations of local underground water conservation districts. Further regulation with respect to water rights is included in TAC, Title 16, Chapter 12, Subchapter K, Rule 12.352. This rule states that any person who conducts surface mining activities shall replace the water supply of an owner of interest in real property who obtains all or part of his or her supply of water for domestic, agricultural, industrial, or other legitimate use from an underground or surface source, where the water supply has been adversely impacted by contamination, diminution, or interruption proximately resulting from the surface mining activities.

Surface water in Texas is defined as water flowing in a defined watercourse (e.g., canyons, ravines, depressions, creeks, rivers, etc.) or stored in a pond, lake, or reservoir. Surface water is owned by the State

~~TNRCC regulations for the TPDES storm water program (General Permit TXR050000, Sector H) require the development and regulatory approval of a storm water pollution prevention plan. Such a plan necessarily addresses the quality of storm water discharges and their monitoring in coordination with other regulatory monitoring provisions. Other activities are to be defined as well, such as good housekeeping practices (procedures to avoid spills, litter, unnecessary waste, or accidents); the selection and implementation of BMPs to maintain water quality and control runoff, erosion, and sedimentation; an inspection and maintenance program for these practices; and a storm water pollution prevention organization/responsibility chart. Further description of activities and compliance under the TDPES program is presented in Chapter 2.0.~~

~~TNRCC regulations for the TPDES storm water program (General Permit TXR050000, Sector H) require the development and regulatory approval of a storm water pollution prevention plan. This plan would necessarily address storm water quality and discharge monitoring (in coordination with other regulatory monitoring provisions); good housekeeping practices; the selection and implementation of BMPs to maintain water quality and control runoff, erosion, and sedimentation; an inspection and maintenance program for these practices; and a storm water pollution prevention organization/responsibility chart.~~

Two major types of TPDES permits may be applied for and, subject to the agency approval process, issued by TCEQ under the TPDES program. Both types regulate discharges to receiving waters from an industrial site. An individual permit may be appropriate given specific water quality provisions (such as effluent limitations) or other industrial and site-specific considerations. A general permit may be appropriate for more typical management of storm water discharges. Alcoa has applied for an individual TPDES permit to discharge combined storm water and wastewater from the proposed retention ponds on the mining area and from a proposed domestic wastewater treatment facility. A draft individual permit (TPDES Permit No. 04348) has been prepared by TCEQ for these discharges. The individual permit addresses the management and monitoring of discharges (including treated domestic wastewater) specifically from the proposed retention ponds on the active mining area, the post-mining area, and the reclamation area. Further descriptions of this program and its related facilities and features are presented in Chapter 2.0, Sections 2.5.1 and 2.5.2, and Appendix C of the Draft EIS.

Alcoa also may be required to obtain general permit coverage to manage storm water discharges from other (non-mined) areas of the proposed Three Oaks Mine (Williams 2003). Under TPDES General Permit TXR050000 Sector H, such areas typically would include coal handling and storage areas, haul roads and access roads, office buildings, and other facilities. The general permit requires the development and agency approval of a storm water pollution prevention plan. This plan would address storm water quality and discharge monitoring (in coordination with other regulatory monitoring provisions); good housekeeping practices (procedures to avoid spills, litter, unnecessary waste, or accidents); the selection and implementation of BMPs to maintain water quality and control runoff, erosion, and sedimentation; an inspection and maintenance program for these practices; and a storm water pollution prevention organization/responsibility chart.

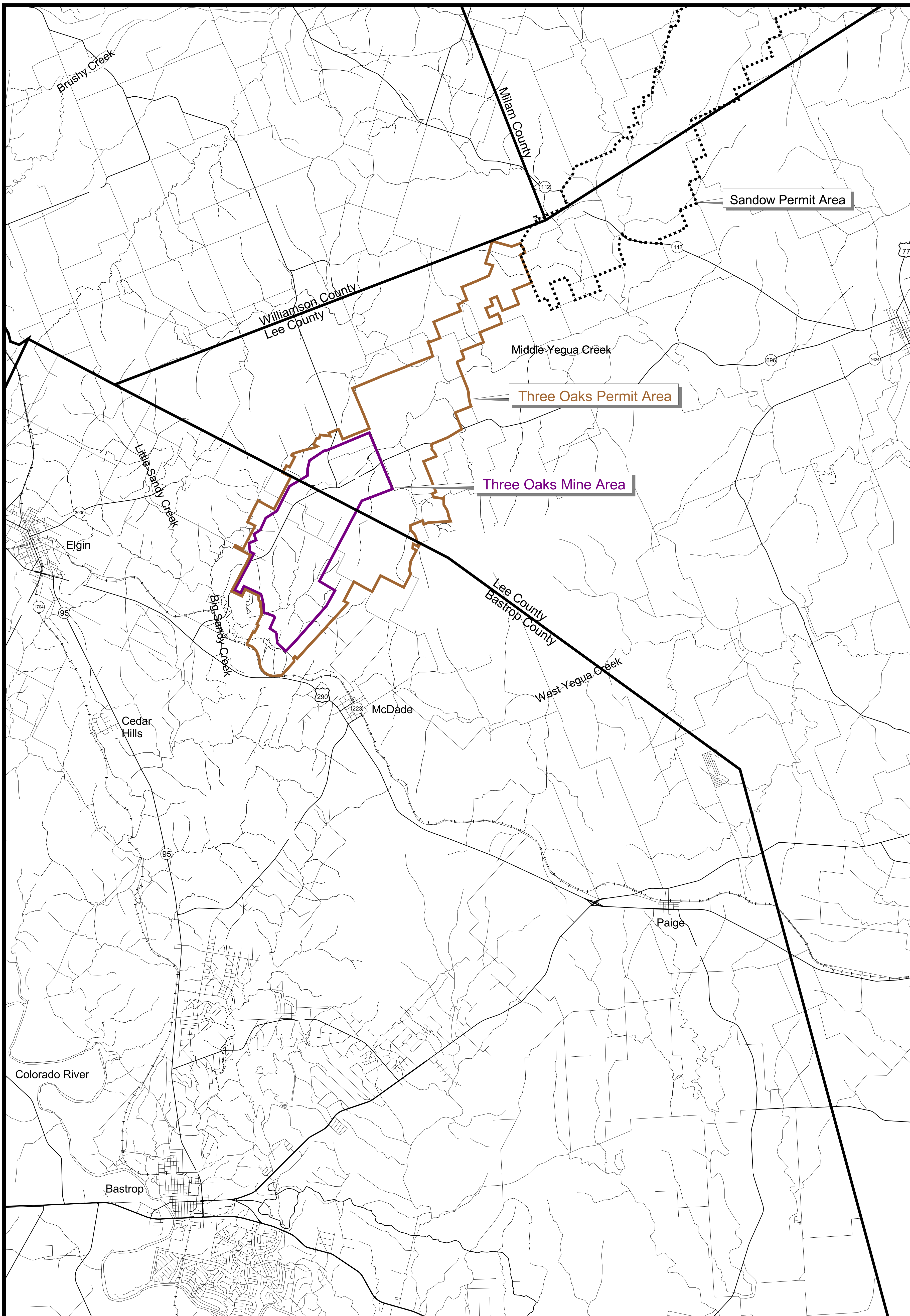
The CWA Section 401 Certification Program (30 TAC 279), as administered by TNRCC, requires the selection and implementation of BMPs, and for Tier II projects (such as the Three Oaks Mine), requires analysis of alternatives that may satisfy the needs of the project in ways that do not adversely affect surface

environmental contractors, ENSR Corporation and HydroGeo, Inc. examined the model input data files, the grid design, the boundary conditions, and the model input parameters to ensure they were suitable for modeling environmental impacts within and adjacent to the proposed project area. In addition, the model was run to examine the calibration, the stability and convergence of the model, and the model's ability to replicate the results presented in the Alcoa Three Oaks Mine RRC permit application (Alcoa 2000 [Volume 4]). A model input parameter sensitivity evaluation was conducted for horizontal hydraulic conductivity, storage coefficients, vertical leakance for each layer, evapotranspiration, and recharge. These input parameters were varied in the model to determine the sensitivity of the model calibration to the input parameter and to determine the sensitivity of predicted model impacts to the input parameter. For the Three Oaks LOM Model, the model was found to be very sensitive to horizontal hydraulic conductivity and moderately sensitive to recharge; the model was not sensitive to the other input parameters. The results of the ENSR/HydroGeo evaluation are available in a report titled: *Review of the Three Oaks Life-of-Mine Groundwater Flow Model for Groundwater Analyses in the Three Oaks Mine EIS* (ENSR Corporation and HydroGeo, Inc. 2002a).

The USACE and OSM determined that the Three Oaks LOM Model is adequate for determining the environmental impacts associated with mine dewatering and depressurization. The USGS evaluated the Three Oaks LOM Model from the standpoint of its representation of the physical site conditions within and around the proposed Three Oaks Mine area. The USGS commented on specific aspects of the model design, particularly the design of the river cells, the use of evapotranspiration in the model, and the model's overall applicability to modeling groundwater drawdown impacts. The USACE has provided additional information in response to the USGS comments. Letters from the OSM and the USGS presenting their peer reviews of the Three Oaks LOM Model are on file with the Fort Worth District of the USACE.

Impacts To Groundwater Levels. Based on the modeling results, dewatering operations in the lower Calvert Bluff aquifer and depressurization operations in the Simsboro aquifer would affect groundwater levels in both aquifers over the life of the mine and for approximately 100 years after the cessation of mining. This section discusses these two proposed groundwater withdrawal activities and their potential impacts on groundwater quantity in the project area. ***Figure 3.2-4a is a reference map to be used in conjunction with subsequent maps showing estimated groundwater drawdown (Figures 3.2-5, 3.2-6, and 3.2-8 through 3.2-20).***

Calvert Bluff Aquifer Dewatering. Dewatering wells would be installed incrementally over the life of the mine in advance of pit development. The wells would be placed peripherally to the active pit area to partially remove groundwater from water-bearing sand lenses that lie above the lignite seams in the Calvert Bluff Formation. These sand lenses are interbedded with clay and lignite zones of very low permeability. As a result, the Calvert Bluff Formation does not contain a single regional aquifer; rather, it has saturated clay zones and sand lenses with the sand lenses being locally permeable and capable of yielding groundwater to wells. Removal of groundwater from these sand lenses would reduce the amount of groundwater seeping into the pit and would serve to stabilize the spoil and highwall for safety reasons and allow efficient operations. Estimated dewatering pumping rates would range from 290 acre-feet per year (180 gpm) (Alcoa 2001c [Volume 3]) to 1,349 acre-feet per year (1,836 gpm) (RWHA 2002c).



Legend

Source: Adapted from Alcoa 2001c.

Three Oaks Mine

Figure 3.2-4a

Reference Map for Groundwater

12/20/02

420 to 480 feet NGVD. The 200 lignite zone in the Calvert Bluff has similar groundwater levels; however, the 800 lignite zone has groundwater levels ranging from 440 to 600 feet NGVD. In the proposed mine area, groundwater in the Calvert Bluff occurs at approximately 20 to 40 feet below ground surface.

The Calvert Bluff 200 through 800 lignite zones would be dewatered at an average rate of approximately 882 acre-feet per year (547 gpm) over the estimated 25-year life of the mine. Drawdown of the potentiometric surface in the Calvert Bluff would be limited to the lower third of the formation as: 1) that is where the dewatering wells would be screened, and 2) clay zones with low permeability separate the water-bearing sand lenses, resulting in a general lack of connection between the lenses. Modeling results of groundwater drawdown in the Calvert Bluff aquifer are shown in **Figures 3.2-5** and **3.2-6** and summarized in **Table 3.2-3**. Based on the modeling results, there would be no drawdown in the upper Calvert Bluff Formation as a result of dewatering activities at the proposed Three Oaks Mine. For year 2030, which is the approximate end of mining for the Three Oaks Mine, drawdown in the 200 lignite zone of the Calvert Bluff Formation is projected to be approximately 100 to 200 feet in the permit area. The 10-foot drawdown area would extend approximately 12 to 13 miles from the permit boundary. For the 800 lignite zone, the drawdown in the permit area in year 2030 would be approximately 20 to 100 feet, and the 10-foot drawdown area would extend approximately 1 mile from the permit boundary. Calvert Bluff groundwater levels in the area of the proposed Three Oaks Mine would begin to recover following the completion of mining.

Pumping of the dewatering wells would result in a direct impact to water levels and, thus, the water quantity for private municipal or agricultural wells that are screened in the lower third of the Calvert Bluff Formation. The degree of impact to these wells would depend on the location of the wells relative to groundwater drawdown in the sand lenses in the lower third of the Calvert Bluff. The cross-section presented in **Figure 3.2-7** illustrates the relationship between drawdown in the various lignite zones of the Calvert Bluff due to dewatering and the potential drawdown in private wells screened within the Calvert Bluff Formation. Wells located within the 20-foot or greater drawdown area for the 200 through 800 lignite zones of the Three Oaks Mine may experience a noticeable decline in water levels; these wells and pumping equipment potentially would need to be modified or replaced in order to continue supplying water at their current rate. Alcoa's proposed groundwater monitoring plan is described in **Table 2-15**. Additional mitigation may be appropriate to provide baseline and operational monitoring data for evaluation of potential mine-related impacts to existing wells within the modeled LOM 20-foot drawdown area of the Calvert Bluff aquifer (see **Figures 3.2-5** and **3.2-6**) (see mitigation measures ~~GW-1 and~~ GW-2 in ~~Section 3.2.3.4, Monitoring and Mitigation~~ ***Table 2-15 of the Final EIS***). If mine-related impacts to private domestic, agricultural, or municipal wells are identified, Alcoa would mitigate the impact as required by the RRC.

Lignite mining into the lower third of the Calvert Bluff Formation, and concurrent backfill of previously excavated pits with mine spoil as the mine pit advances, would result in a permanent alteration of the lithologic units in the Calvert Bluff Formation and a corresponding localized permanent change in aquifer properties within the mine pit area. It is anticipated that the mixture of clay and sand in the backfilled pits would have a lower horizontal permeability and potentially an increased vertical permeability (Alcoa 2000 [Volume 10]).

The Three Oaks Mine would affect approximately 5 percent of the total outcrop area of the Calvert Bluff Formation between the Colorado and Trinity Rivers. Recharge to the Calvert Bluff aquifer would come from